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BY TAKING THOUGHT.

WE notice in a recent number of a contemporary publication a plaint from a classic contributor, who laments that there is not some way of ready reckoning by which an architect can tell just how large or how small to make the details of portions of his building which are far from his eye, and also just how to modify contours of moldings placed above the eye so they shall give the proper effect when viewed from below. There have been some very ingenious attempts to accommodate indolent persons such as the contributor in question, and it does seem too bad when one is so anxious to do the right thing there should not be some sure way of accommodating him, but, as a matter of fact, architecture is altogether too subtle in its nature to admit of any such formulation. We all remember the familiar section of the ring around the eye of the dome of the Pantheon, which seems so classically correct when viewed from below, and so abnormally distorted when viewed in right section. And we remember the pleasing, if somewhat elusive, theories which Professor Goodyear has developed in regard to variations and irregularities of the early Italian work. But there is no sure guide which will enable a man with his eyes shut, or his mental muscle relaxed, to determine the details of design. The extent to which laziness is an important determining feature of poor composition is something which the lazy ones themselves are the last to appreciate, and we imagine that most of the unsatisfactory work which the public is compelled to endure on its large buildings owes its lack of merit to sheer unwillingness on the part of the designer to buckle down to hard work and to study his design. To be sure, not one architect in ten knows how to study a design at all, and many who would possibly give the time if they had to are usually willing to let what they falsely call well enough alone, so long as it pleases the owner. There are phenomenal geniuses who appear about once in five hundred years, who are able to do things right the first time, but for all the ordinary mortals born in between times it takes hard work, and doing it over and over again, generally wrong to start with and only a little less wrong with each successive redrawing and studying, to get the design of a building into shape that means anything like success. It is so easy to crib our forms nowadays that the unthinking mind often calls the crib the end rather than the means, and sighs for a further simplification of the process by which he can merely transplant his sections or his ornament and have them increased or diminished in the scale of proportion according to a set of tables. But this is not architecture. Fortunately there is a large and ever-growing array of serious thinkers in the profession who treat architecture with the respect which it compels, and spare neither thought, energy, tracing paper, nor pencil. These do not need a ready reckoner.

A ONE HUNDRED THOUSAND DOLLAR LIBRARY.

WITH this issue we begin the publication of a series of articles illustrative of a library building to cost one hundred thousand dollars. The object of this, as of the previous series which have been published in our columns, is to call out suggestions of the possibilities of brick architecture as applied to specific problems. These series do not imply competition so much as comparison of points of view taken of the same problem by different well-known architects, and as such we believe they will be of great value to our readers and will very materially serve the purpose of fostering excellence in constructions in burnt clay. The library problem is a peculiarly interesting one just at present. The example of Mr. Carnegie has borne fruit in many parts of this country, and it is becoming, one might almost say, a fad on the part of rich individuals to present libraries, fully built and equipped in the most modern manner, to their favorite municipalities. This is certainly a feature of modern civilization to be warmly encouraged. We cannot, of course, expect a full study of the specialized practical requirements of the problem, within the scope of articles such as we present, but the essential characteristics of the design, the adaptability of burnt clay thereto, and considerations of essential fitness will, we believe, be set forward in such manner as to commend themselves to our readers.

CONVENTION OF THE AMERICAN INSTITUTE OF ARCHITECTS.

THE American Institute of Architects has just held its thirty-third annual convention at Pittsburgh. During the three days' session some very interesting papers were presented and discussed, notably an essay upon the influence of Jews upon architecture, by J. W. Yost, of Columbus, Ohio, and a very thorough and comprehensive study of the subject of architectural competitions, by Prof. W. R. Ware. From the standpoint of the profession as a whole, the most important action taken at this convention was the adoption of recommendations made by the committee on education, in accordance with which the Institute is practically committed to such alterations of its by-laws as shall require an educational test for membership in its body. This is a move which has been agitating

for many years, which has been successfully in operation by the Royal Institute of British Architects, but which has come slowly here. The unanimity with which this measure was approved by the convention was considerable of a surprise, and a very pleasant one to many who have followed the course of the agitation leading up to this during past years. In brief, it is proposed that after 1904 membership in the Institute shall be open only to those who are graduates of a recognized architectural school, or who have successfully passed such examinations as shall be prescribed by the Institute. We consider that this action of the convention marks one of the most important steps taken by this body since its formation.

Another very highly commendatory action was taken in the indorsing of the course which has been pursued by Secretary of the Treasury Gage, in relation to the competition for the New York Custom House, which has recently been decided in favor of Mr. Cass Gilbert.

The election of officers, which took place on Thursday morning, resulted in the choice of Mr. R. S. Peabody, of Boston, president; W. L. Eames, of St. Louis, first vice-president; Frank Miles Day, of Philadelphia, second vice-president; Glenn Brown, of Washington, secretary and treasurer; and for directors, Henry Van Brunt, of Kansas City, James G. Hill, of Washington, and Norman S. Patton, of Chicago.

NEW BOOKS.

MODERN FRENCH ARCHITECTURE. One hundred views chosen by Russell Selfridge, architect. Boston; Bates & Guild Company. 1899. Price, $10 in portfolio form; $12, bound.

We had thought ourselves reasonably familiar with French architecture as it exists, but confess this collection gives us a very pleasurable surprise. It is beyond question the best lot of modern architectural photographs that have been put on the market. It includes private houses, hotels, apartments, and a few civic buildings, most of the architecture, however, being confined to the domestic work of Paris itself. It is of interest to us to note, by the way, that out of forty-seven of the private houses illustrated twenty-five are principally of brick.

ESTIMATING FRAME AND BRICK HOUSES. By F. T. Hodgson. New York, David Williams Company, publishers, 232–238 William Street. 1899. Price, $1.00.

We have received a copy of a very compact volume of some one hundred and fifty odd pages, giving in detail methods of estimating the cost of frame and brick houses. This book takes up all the different features of ordinary construction, giving prices, rules for obtaining quantities, and incidentally a good deal of very cogent advice in regard to methods of construction.

PEN DRAWING. An illustrated treatise by Charles D. Maginnis, Boston. 1899. Bates & Guild Company.

ARCHITECTURAL RENDERING IN PEN AND INK. Arranged for use in the School of Architecture at the University of Pennsylvania. Edited by Frank Allison Hays, with text by Arthur Brooke.

For years the only treatise concerning itself with the large subject of pen drawing has been the monumental work of Mr. Pennell, and this is less a manual of instruction for the student than a guide to the intelligent amateur, beside being published at a price quite beyond the slender means of the ordinary draftsman. Now, quite coincidently, two volumes appear whose acknowledged purpose is the instruction of those who most need it, and both are admirable.

With the same end in view, it is but natural that there should be many points of resemblance between the two books. The direct teaching is, of course, very similar, and among the illustrations chosen to point a moral one finds two or three common to each. But with this the similarity ends.

The authors are both pen draftsmen of recognized ability, and, however much they may agree as to the main facts, it is interesting to notice several flat contradictions in matters of detail. For instance, as to pens: Mr. Brooke suggests that "if Goldsmith had been a pictorial as well as a literary artist" he would have added pens to the list of things he loved when old, — "old friends, old times, old manners, old books, old wine"; while Mr. Maginnis's dictum is "The student will find that most of the steel pens made for artists have but a short period of usefulness," — a case of doctors disagreeing with a vengeance, yet there is without a doubt a truth reconcilable with both statements. If it were possible, in the evil times upon which we have fallen, for Mr. Maginnis to gain possession of such an instrument as that of which Mr. Brooke writes, it would probably never be parted from him except through downright theft, and the reviewer remembers distinctly the pens manufactured by Messieurs Blanzy Poure et Compagnie, obtainable during his novitiate, but of late years undiscoverable at the dealers in artists' materials, here in Boston at any rate, — delightful pens, which possessed no Gallic vices, but only Gallic virtues: responsiveness, sympathy, and, above all, the faculty of growing old gracefully. As to inks, too, there seems to be considerable latitude of opinion among experts, since Mr. Brooke recommends Higgins's unreservedly, while Mr. Maginnis suggests that Bourgeois' French Ink would be quite as good, if not better, were it only put in the pleasant un-tip-over-able bottles used by Higgins.

But, after all, these are matters of no great consequence; the real aim of both books is the instruction of the unlearned in pen drawing, how best to avoid those difficulties sure to beset one at the outset. In this it must be pleasant for the two authors to observe there is little or no trenching on the other's preserves. Mr. Maginnis has succeeded in producing within the limits of a compact, unpretentious volume a deal of information most valuable to the beginner. With the utmost simplicity he sets before the reader all the vital facts of the art, taking up and disposing of the lions in the student's pathway, one by one: bad composition, lack of repose, over-elaboration and the like, drawing his illustrations from every conceivable source. His own name is familiar to all of us on so many of the best drawings in the technical periodicals that no gift of prophecy is needed to foretell a sure success for his work, a success not only for himself and his publishers, but also for those who intelligently ponder his words.

Mr. Brooke's book is very different in "get-up" from Mr. Maginnis's. It is large and rather magnificent in effect, so large and magnificent in fact that at first sight one feels that here is another error in the little understood art of book-making. Once within the covers, however, it is easy to understand that the size was necessary in order to attain the results at which the authors have aimed; for this is not only a treatise, but a genuine text-book, prepared with an eye to direct instruction in the classes at the University of Pennsylvania. Here are a number of photographs of architectural subjects carefully reproduced in half-tone, mounted and matted, and their duplicates printed in pale ink, over which it is intended the students shall work. The illustrations proper, printed as marginal notes, are apparently not quite so well reproduced as those in Mr. Maginnis's book, but the text here constitutes the item of greatest value. Mr. Brooke, had he not elected to follow the profession of architecture, might well have become a literary man of note. Not only do his sentences have a clarity and distinction rarely found in so purely technical a treatise, but, as well, a certain charm and beauty one would never have dreamed of as possible in any text-book.

Comparisons are odious, and fortunately here none is necessary. The two volumes complement rather than rival one another, and it would be well if every earnest student could possess both. So much has been given to the world under the head of art criticism without producing in its readers more than the absurd parrot talk one hears in the galleries, that it is pleasant to welcome two such able works as these, both clear, concise, and not written by mere theorists, but by acknowledged masters of the technique of their subject.

A Public Library, to Cost One Hundred Thousand Dollars.

PROGRAM.

A PUBLIC library is to be erected in a New England town of twenty-five thousand inhabitants. The proposed lot has an easterly exposure on one side of a small public square and on the axis of a prominent street. The lot measures 250 ft. on the front with a depth of 200 ft. The front is level, but the grade slopes rapidly towards the back at a radiant of one in five. No portion of the building proper is to come within 20 ft. of the front line of the lot or 10 ft. of the other three lines. Opposite the library across the square will be built the village church.

The requirements are as follows:—

A book stack (closed stack) to accommodate forty thousand volumes; a reading room with 1,500 sq. ft. of area; a delivery hall of 900 sq. ft.; a newspaper and periodical room of not less than 1,000 ft.; a trustees' room; librarian's room; a cataloguing room; unpacking and work room; toilet rooms for employés and the public. The reading room may be used as a reference library or a special room may be provided. A small room may be shown for the exhibition of pictures and photographs. Provision must be made for a future extension of the stack room to furnish accommodations for sixty thousand more volumes. The style is left optional, but it must be one that will, if possible, harmonize with its surroundings, while it must clearly express the function of the building, and adapt itself to the material used, which, so far as the exterior walls are concerned, will be exclusively burnt-clay products.

FRONT ELEVATION.

CONTRIBUTION.

BY THOMAS M. KELLOGG.

The interest manifested in public libraries is constantly increasing, and nearly every town of a few thousand inhabitants now considers the public library of equal importance with its schools and churches. It is surprising how within the past few years public libraries have sprung up in all parts of the country; nor is this rapid growth of storehouses for books by any means confined to our larger cities. Even small country villages of a few hundred inhabitants are beginning to have their free circulating libraries, where the children and even the older people may be seen on certain appointed evenings going in and out with books under their arms. It may be that the library is only an adjunct of the corner grocery store, or possibly a room set apart for the purpose in a portion of the public school, but be where it may, it is well patronized and adds greatly to the educational and intellectual development of the community. Many towns which have thus started with a nucleus of a few hundred volumes, housed in any convenient or available corner, have by the energy and public spirit of a few prominent citizens, finally dedicated a site for a building, to be devoted entirely to library purposes, and if the energy and public spirit holds out long enough, the building is sure to follow, sooner or later.

In the present instance, the site is already selected for us, and one's imagination can easily picture it to be a very fine one. A public library should always, if possible, be located on a public square, or, in other words, it should have the best the town affords. Plenty of space, light, air, and pleasant surroundings should certainly accompany a building to be devoted to literary and educational purposes. It should also be easily accessible, and treated both in its surroundings and the style of the building in such a manner that a stranger in passing should not be compelled to make inquiries as to its purpose.

Here we have a large lot, 200 by 250 ft., on one side of a public square and on the axis of a prominent street. The treatment should therefore be orderly and symmetrical so far as possible, and the suggested layout consists of a broad and inviting central main approach, a side entrance for supplies, books, etc., while in the rear, on either side, are simple flower beds, ending with an exedra stone seat under the shade of a large elm tree. A well-trimmed osage hedge forms the boundary line on three sides, while the front is finished with a low brick wall or stone coping.

The building is of course located in the center of the lot, with its axis on the street referred to in the program. A broad, open terrace leads through a moderate vestibule into a large and effective hall, which answers for the combined purpose of delivery and card catalogue rooms, and may be used for memorials, statuary, etc. The delivery desk is directly in front, while on either side, cross halls, 12 ft. wide, lead direct to the main reading room, and newspaper and periodical room, respectively. On either side of the front entrance, and opening from the hallways, are the trustees' room and a room of corresponding size for the exhibition of pictures and photographs. The librarian's room is in close touch with the working department of the library, and occupies a space on one side of the delivery hall corresponding with that devoted to cataloguing purposes on the other.

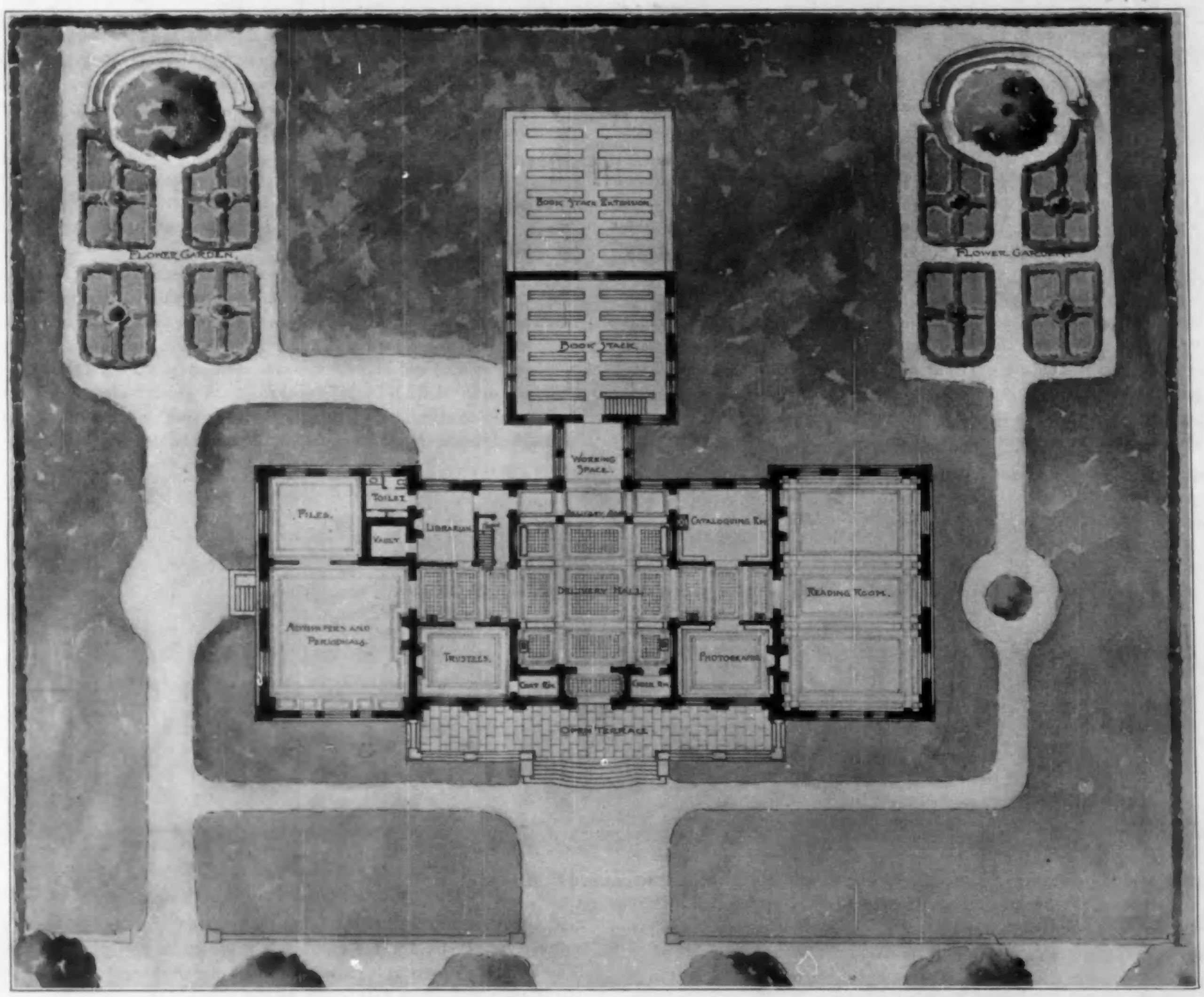
The librarian's room is also easily accessible to the trustees' room and is provided with a large fire-proof vault and private toilet. Adjoining the newspaper and periodical room is a room for files; these accumulate very rapidly, and are thus convenient of access for purposes of reference.

The cataloguing room connects with the unpacking and work room below by means of a large lift. The latter room is placed in the basement, which, owing to the rapid slope of the ground towards the rear, would be entirely above ground, and thus convenient of access for the outside delivery and unpacking of books.

It was thought best in a building of this size and character to place the toilet rooms in the basement, where they would be more retired and less objectionable. A room for bicycles would nowadays seem a necessity and this could also be placed conveniently in the basement, adjacent to the outside area entrance where shown.

A single staircase was thought sufficient for the requirements of a building of this size, leading from the basement to the first story, and to that portion above, where the height of ceilings would permit of a second floor, viz., over librarian's, trustees', and cataloguing rooms, also over room for photographs. The newspaper and reading rooms, also delivery hall, would carry up full height, and additional light and architectural effect obtained by means of skylights in the roof and ceilings.

The space back of delivery desk would have a lower ceiling with gallery over, thus connecting with the upper tier of the book



PLAN.

stack, and forming a passageway on upper floor for rooms separated by the delivery hall.

The book stack is convenient of access to the delivery desk, and is complete in three tiers, one of which is below and one above the main floor level. The present capacity is for forty thousand volumes, with a future extension shown for an additional sixty thousand volumes.

The exterior of a public library should have distinct characteristics which will enable one to determine at once the purposes of the building. Towers and broken sky-lines, undue enrichment or ornamentation seem to be wholly out of keeping and almost invariably detract from the dignity and simplicity which belong to a building of this character.

Plain wall surfaces should predominate, and whatever ornamentation is required should be concentrated in such a manner as to emphasize rather than to conceal the plain surfaces.

The principal entrance should be emphasized more by the surrounding detail than by an unnatural effort to obtain a large and monumental doorway. Unless the building be of vast proportions the scale is apt to suffer and the architectural effect of the whole building greatly injured by striving for the popular demand for what is called "an imposing entrance." In the present instance an effort has been made to keep the exterior simple and dignified, and to preserve to some extent the characteristics of a library building of moderate dimensions.

It is also treated in a manner entirely suitable for the required materials, and would be constructed wholly of brick and terra-cotta. The plain wall surfaces should be faced with a light golden-brown brick, with trimmings, cornice, etc., of cream-white terra-cotta. The cornice could be somewhat enriched with ornamentation, while the series of seven arches in the central portion forms ample emphasis for the entrance without injuring the general proportions.

The roof would be covered with greenish-brown unglazed tiles.

The entire building including the suggested layout of the grounds could be completed well within the limit of $100,000, which would doubtless include a sum sufficient for appropriate interior decoration and enrichment.

The Artistic Possibilities in the Use of Roofing Tile. II.

BY W. A. OTIS.

THE conditions to be fulfilled in our Northern climate are far more difficult to successfully accomplish than in most parts of Europe. The variations in temperature often even in one day are something appalling, while the extremes of winter and summer are such as to put all mechanical products to the severest tests. As a result of these two reasons the actual and exact reproductions of old or classic tile have not been most successful, and various expedients with roof boarding, nails, cement, pointing, etc., are necessary to overcome the difficulties; so that such roof covering is really only an imitation, and rarely as satisfactory as some other forms more modern and scientific.

These modern shapes, generally with patent and interlocking joints, often have a strong character of their own, even though it may not be that of the so-called classic form. Also they have practical qualities which the average modern owner regards as of far more importance than mere traditional shape; so that in nine cases out of ten their ability to better shed water and their greater economy outweigh the old conventionalities.

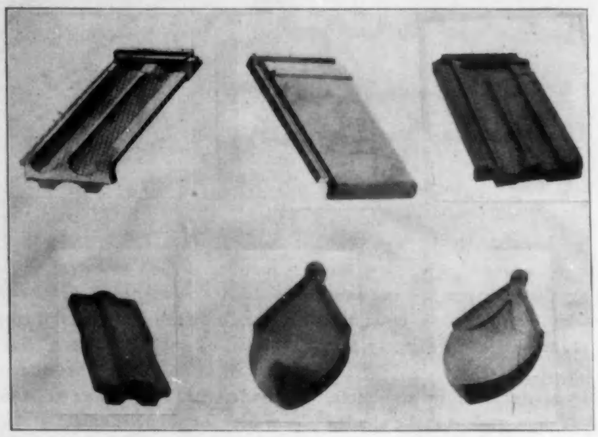


FIG. 14. MODERN TYPES OF ROOFING TILE.

Again, by their mechanical perfection they are typical of this very age, and should just as properly become a part of our architecture as steel skeleton construction, and other modern and practical devices. Figs. 14 and 15 show some of these modern interlocking types, the artistic qualities in many being very pronounced.

Moreover, if manufacturers will persist (by steadily adhering to a few approved patterns) these very forms will themselves soon become classic in American architecture, so that those who demand age as the special seal of approval to their work can then have it.

If, however, the manufacturers continue, as now seems their aim, to change every year or two their patterns, together with a multiplicity of minor variations, labeled (often falsely) "improvements," they will not gain that increased strength and prestige which rightly come from long and honorable usage.

In this connection, it is well for an architect to consider the confusion and annoyance that can overtake himself and the vexation and expense that may come to his client by the specifying of shapes or shades that are only temporarily in the market. An addition is to be made to a building, say five or six years after its completion; without making a special order there are no tile of this kind to be had! The same case may be even more provoking when possibly a dozen tile are wanted to mend a roof (say one injured by lightning, for, of course, a tile roof would need no repairs from any ordinary cause) unless only the old and staid shingle tile are employed.

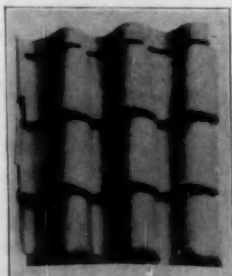


FIG. 15. MODERN TYPE OF (SO-CALLED) "SPANISH TILE."

These are much more serious and practical objections against the extended use of roofing tile to-day in *small buildings* than most of the manufacturers are willing to acknowledge, and such arguments rarely receive any consideration, and will not, until architects insist upon throwing out all patterns except such as are to be standard, and can be expected to be in stock every year for the next fifty years.

If this business is to become a very great one, it is absolutely essential (trivial as the manufacturers may declare the arguments to be) that our factories resolutely turn their backs upon the unfortunate American method of catering to and changing the fashion.

For an occasional enormous and monumental building this need not apply, but for the great mass of buildings which constitute the vast bulk of the work it is important. The manufacturers must themselves set the example, and, weeding out all but a very few of their best designs and colors, keep them always in stock. By this method the design perforce will soon become classic enough to satisfy all except an occasional taste, where expense is immaterial. But, to return to the consideration of the artistic effects obtainable by the shape of the tile themselves. Among the historical tile, now generally in the market, most prominent are the so-called Spanish tile (in reality not Spanish at all, but Dutch), as in Fig. 15, with the alternate convex and concave surface all in one piece.

The effect of light and shade upon these alternating surfaces, with the continuous lines from eaves to ridge, is the beauty of this tile, especially effective in round tower work, where the lines radiate from the apex of the roof, the tile being graduated in size.

This is almost the only curved tile in the general American market, and where the composition of any particular design seems to require such lines on the roof, it is about all we can obtain without unusual expense.

This effect of a series of straight lines (usually formed by a curved tile covering over and under one) from eaves to roof is in reality the marked feature of most of the historical tiles. Variation in character and much artistic effect are gained by the distance apart of the lines of semicircular tile, — a feature known as the alignment.

FIG. 16. ITALIAN TILE.

Where the upper and the lower member were both small, semicircular tiles of the same size, as in much Italian and Spanish work, the alignment is very small. Fig. 16 shows an example of this kind of tile from the Certosa at Pavia.

The curved lines, the delicate shades at the ends of the tile, the shading on the tile themselves, are, when viewed from a distance,

unquestionably extremely beautiful, while the variety of shapes that can be obtained shows the great possibilities of artistic results that come from this style of work. But, evidently, much of the glamour of this work arises from its association in our minds with the beauties of classic and Renaissance buildings.

In strong contradistinction to these tile come the ordinary flat shingle tile, previously mentioned. In this case the only modifications feasible for artistic effect of shape are the contours of the ends, in a variety of forms, which necessarily must be quite simple, usually the round, the octagon, etc., as shown in Fig. 1.

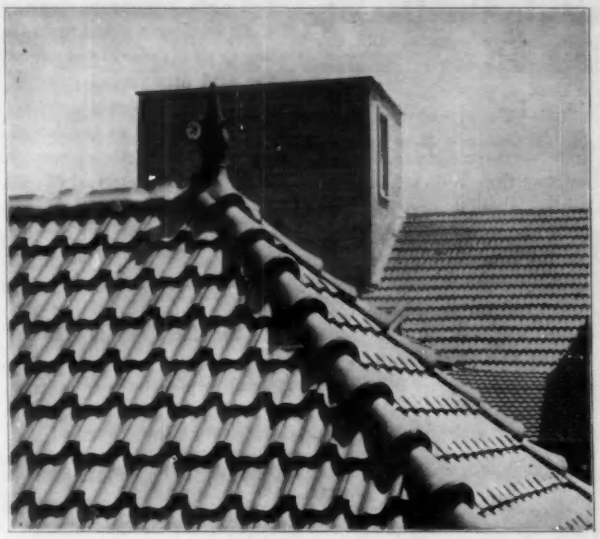


FIG. 17. MODERN INTERLOCKING TILE.

As previously noted, many of the other varieties of tile in the market can be classed under the general head of interlocking, and are, as a whole, essentially modern in character, it having been found practically impossible to utilize or economically copy the better known historical shapes. Among these shapes are the ones already indicated in Fig. 14, while their combinations upon the roof are indicated in Figs. 9, 10, and 11, as well as in Figs. 17 and 18.

As will be seen and as is generally appreciated by architects, many of these have strength and vigor of line, and so make shades and shadows in the detail that certainly present possibilities of rendering the whole effect of roof really just as truly artistic as the old historical style, and by a judicious choice of patterns it is certainly possible to find a composition of line and shade that will effectively and properly harmonize with almost any of the historical styles of architecture which would be adaptable to the usual modern requirements.

When considering the choice of a shape to be employed, the first point to decide is whether a bold effect with deep shadows is desired, or if a merely flat effect would harmonize best with the general design. For large and high roofs the great bold forms with the deep shadow on each tile itself is usually by far the most effective; while a small roof comparatively near the eye of an observer, with this same tile, would be entirely overpowering.

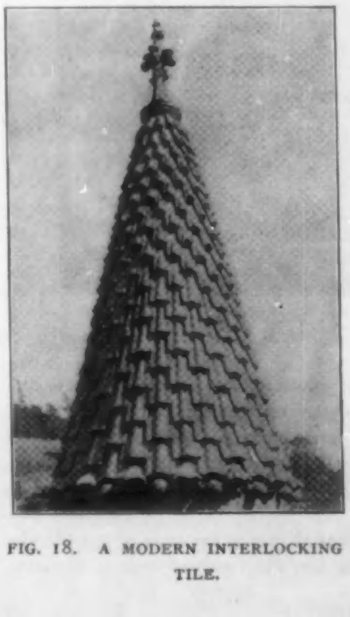


FIG. 18. A MODERN INTERLOCKING TILE.

It is astonishing how bold and large a tile may be and still not appear in the least overmuch so when above one on a large roof. Fig. 19 is an illustration of this character of tile. In very large and unbroken roof surfaces this is especially good, while for one frequently broken by dormers, gables, etc., some of the smaller forms are preferable.

In some of the Southern Renaissance styles when precedent is followed the roof is often studied to be as inconspicuous as feasible, or if not inconspicuous to at least not be at all overpowering, and a smoother effect may be sought after.

But as a general rule in our American work, where the endeavor, as in the early French Renaissance, is to combine a certain refined artistic feeling with the picturesque side, very much of that result will depend upon the roof, the bolder effects are especially desirable. Hence, one looks for such tile (while mechanically perfect) as will at the same time give these bold effects. As the lines and the shadows of the roof covering depend almost exclusively upon the shape of the tile themselves, so the artistic possibilities, with the present patterns in the market, are much greater than generally imagined, while if considered essential for special work, forms from historical and other sources increase the number to such an extent as ought to satisfy every designer.

A consideration of the shapes will also satisfy one that not merely by the variations of contour is one able to obtain what might be called a "pretty effect," but there are also extraordinary possibilities of more perfect harmony of design. A Gothic roof can be made with tiles where ends are shaped like a Gothic arch, etc.; while for some distinctly American composition the design of a

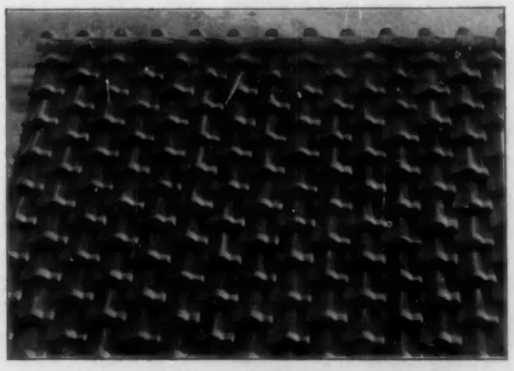


FIG. 19. LARGE BOLD TILE.

simple form, with no great attempt at ornamentation, is certainly likely to be the most satisfactory.

The consideration of the shape of the tile themselves naturally leads to the possibilities of construction of tile into

PATTERNS,

which is the third means, somewhat largely employed by designers for the artistic treatment of tile. It is emphatically the most difficult of all the methods, requiring, as it does, very decided ability and artistic feeling on the part of the designer to succeed. The great difficulty is to take the happy mean; for if the design is too unimportant and insignificant, the effect is weak, and almost as bad as if the other extreme was reached, where the pattern of the whole roof is so striking, vulgar, and offensive as to overwhelm everything else, and completely kill the architectural effect.

This method of treatment in Europe is almost exclusively a modern or medieval one, and if ever only very rarely employed in the old classic period. In the Orient, on the contrary, its use seems to

FIG. 20. AN EXAMPLE OF TILE IN PATTERNS.

have been very early, since glazed roofing tile are ancient in China; but it scarcely appears in European work before the time of the Byzantine and Romanesque.

All figures in this class of design must, of a necessity, be extremely simple and the combinations formed by straight lines. As a result of laying the tiles in rows, the figures become either straight bands following the courses, or else figures bounded by straight lines, and of these, diagonals are by far the most effective, forming as they do the so-called diamond or lozenge shapes, which are very numerous and rich.

There may be readily distinguished two groups or classes of patterns: —

First, those where the designs are produced by the introduction of tile of different shapes (but of course of the same general dimensions, so that they will lay together). These patterns as seen upon the roof are not particularly conspicuous, since the color of both pattern and field is the same, but none the less the results obtained are often decidedly artistic, and it is to be wondered that the advantages of this method of treatment are not oftener seized upon by designers. An example of this use is shown in Fig. 20, being a fragment of one of a tile company's Columbian exhibits.

The simplest treatment is by straight bands of different tile, usually those of rounded or octagonal ends forming the design. An example of this is shown in Fig. 21, from a chapel roof in Baltimore.

Such a scheme is more agreeable to the eye than the monotonous surface of a great roof, but can scarcely be called an extremely high artistic ideal.

Upon towers or spires, especially if polygonal in plan, these bands are, however, much more effective and desirable. An effect of this kind is produced on towers by changing size of tile, as Fig. 22.

The lozenge forms, however, are by far the most effective and satisfactory, and in a very quiet way may give a very dainty result. It certainly is a treatment worthy of much wider use than is general at present. Fig. 23 illustrates the possibilities of this use of tile.

FIG. 21. ORNAMENTAL EFFECT PRODUCED BY LINES OF DIFFERENT SHAPED TILE.

In the second method patterns are obtained where the tile are alike as to shape, by different colors of tile, or by patterns on the tile themselves.

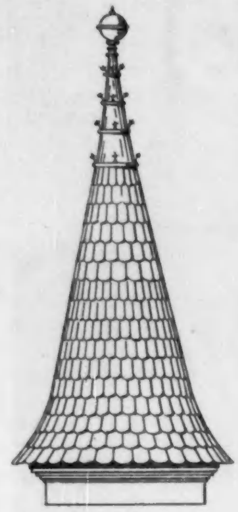


FIG. 22. SHOWING BAND EFFECT PRODUCED BY CHANGING THE SIZE OF TILE ON A TOWER.

The tile which gives such designs are usually glazed to give color effect, while the great portion or background of the roof is the common red. The most usual glazes are white, black, green, and yellow. One of the best known examples of this recently was the German Building, at the Columbian Exposition, which was extremely effective and artistic, while at the same time so thoroughly harmonious with the architecture that it was really not noticeable, strange as it may sound, and no one seems to have ever considered it necessary to criticize it.

For an effective use in this method, a large unbroken roof surface is very essential, or else a very picturesque outline, or possibly a tower, with just sufficient surface to allow small dots and points of color. The best known, and possibly one of the oldest existing roofs of this character, is on the cathedral of St. Stephen's at Vienna, where the roof scheme supplies much of the character to the old Romanesque portion of building, and its great surface is beautiful in color, with the lozenge pattern standing out boldly, as shown by Fig. 24.

In many smaller buildings, especially in Germany and adjoining countries, one finds striking and beautiful examples of this class of design. The cathedral at Basel shows similar treatment.

For large, or monumental, or even specially picturesque work, there would be on the ground of expense probably no serious objection to the glazing of a few tile for these designs, for only a very moderate expenditure is required; especially upon low domes a most effective result may be obtained, as shown by Fig. 25, from a French "projet" of a memorial chapel. But examples of this kind of ornamental use of tile are numerous in Germany and Austria, and fully demonstrate the great possibilities of its artistic use.

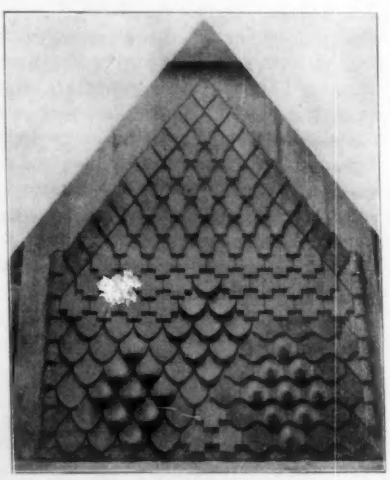


FIG. 23. AN ARTISTIC TREATMENT OF ROOFING TILE BY PATTERNS WITH DIFFERENT SHAPED TILE.

This use of tile, where color, shape, and pattern may all be combined, certainly represents the height of their artistic employment. This field, as far as America is concerned, is as yet almost untried, and if only proper study and ability are used in the solution of some future problems of this kind, the advance of tile roofing of the most artistic character will be thoroughly assured.

While the effect of tile roofing is of course gained very largely by the tile themselves, yet possibly in this more than in any other the finishing touches, so to speak, and the strongly marked qualities of individuality and artistic ability will be shown by what may be termed

FIG. 24. ROOF TILE IN COLORED PATTERNS, ST. STEPHEN'S, VIENNA.

THE ACCESSORIES,

such as the hip and ridge coverings with the finials that mark the beginning and stopping points. As the requirements of a covering for a ridge or hip are, when reduced to its simplest expression, merely a half-circled tile, there is not an extremely wide field for variation: but whether the historic Greek, Gothic, Japanese, or some more modern form be used, there is always a pronounced character, showing that even within the narrow limits permissible a decided expression may be given to these features, which will in turn give most extraordinary finishing touches and beauty to a roof; while the omission of them or the use of an undesirable pattern quickly reduces a roof to the very commonplace. As for finials, they represent either a climax of the entire artistic scheme, or else unfortunately sometimes a most frightful anticlimax. A few of the usual forms of rolls and cresting are shown in Figs. 27 and 28.

Naturally, these accessories should as much as possible be in harmony with the general character of the tile covering. Where that is bold and rugged the hips and ridges should likewise partake

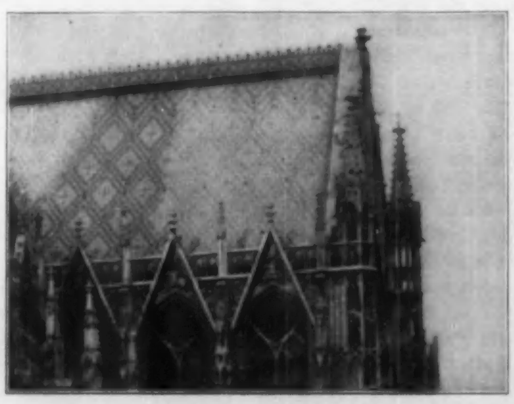


FIG. 26. ELABORATE PATTERN TILE ROOF, VOTIVE CHURCH, VIENNA.

of that character, or where more smooth and equable the less pronounced ones are desirable.

In fact, under all circumstances, for best results they should accentuate the characteristics of the tile themselves, the knobs or the joinings of each section making clear, sharp-cut points against the sky, all of which very greatly adds to the whole artistic effect.

To the stock patterns of hips and ridges architects may usually gracefully submit, as they are generally both practical and rather artistic; also to the simplest expression of a finial there is not much criticism, but they should all be chosen with care, and not left to mere chance. As to the fine attractive finial, however, when used from time to time, a special design is almost always essential; these give an especial touch of character and individuality to a roof. A finial even of charming design that may be artistic for one place often is perfectly abominable when placed upon a totally different kind of roof. Very high finials in terra-cotta, however, seem rarely in good keeping upon the roof, and such features are more properly of metal, while the lower finials seem to be especially adapted to the heavy material.

In the more classical schools of design appear those accessories which it is a little difficult to classify, whether they are a part of the cornice of the gables or of the roof covering itself, viz., the ornaments known as acroteria, which in the old Greek and Roman architecture were so very effective, and gave to the entire roof a still further touch of artistic and refined treatment altogether charming. Examples of these are shown in Figs. 2 and 3. This feature of tile

FIG. 25. PATTERN TILE UPON DOME.

roofing quite rarely now seen in modern design is, however, an effective agent and should not be forgotten. For buildings in certain positions (especially rather isolated ones) these features are of exceptional importance and may well be studied and used much more than at present.

From the foregoing it would appear that the artistic possibilities of roofing tile are exceptionally large, while the field is as yet one scarcely touched upon by American architects.

It offers the widest range to the artistic designer, and when successfully carried out adds enormously to the real and lasting beauty of a building.

Even the best of tile roofing is not wholly satisfactory when used as a cloak for a bad design. A roof of poor outline or generally poor shape cannot be expected to become a thing of beauty, merely because covered with terra-cotta plates, when the error and trouble is a fundamental one. It can no more be remedied by a covering of roofing tile than the bad architectural design can be corrected by covering it over with carving. To be sure, the observer may be diverted and deceived for a brief time, but sooner or later the trick

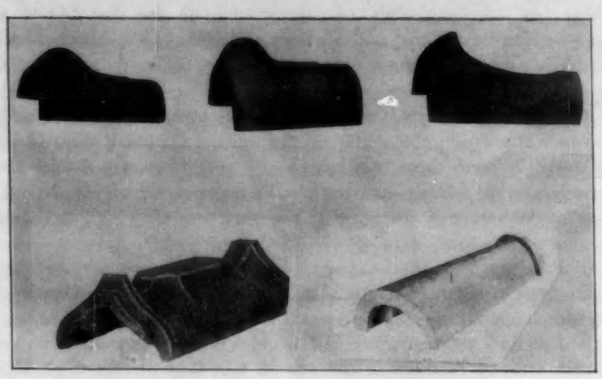


FIG. 27. TYPICAL HIP AND RIDGE ROLLS.

will be discovered, and the means used, though beautiful themselves, will lose by it.

Hence, it is of special importance when a roof is to be covered with tile and become so prominently the crowning feature of the building, that the outline, construction, and general management should receive much more study than usual.

Then designers will be able to take the very fullest advantage of all the possibilities in color, form, patterns, and accessories. And if when tile are used the minor features are each studied with the care they merit and with the possibilities they possess, the artistic value of even simple buildings will be enormously increased and certainly thereby the architect will lose no glory.

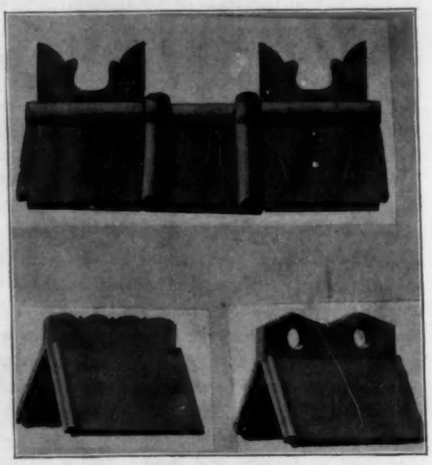


FIG. 28. SOME CRESTINGS SUITABLE FOR TILE ROOFS.

Curiously enough, in this line of work the architects seem to be the ones who have always held back, for the makers of the high-grade tiles have thus far worked largely from their own inspirations. The most artistic of our designers seem rarely to have interested themselves more than to complain of the lack of the impractical and strictly historic shapes, and only occasionally shown a proper appreciation of the real riches spread before them.

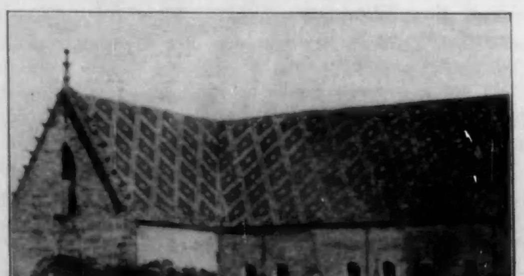


FIG. 29. TILE PATTERN, CATHEDRAL ROOF, BASEL, SWITZERLAND.

WITH CLUBS AND SOCIETIES.

THE T Square Club is this year making an experiment in the management of the competition work in design which will be looked upon with interest by other architectural clubs.

A European Traveling Fellowship is to be awarded in June on the basis of seven monthly competitions, each counting by itself, but all related to the same subject, so that the competitors have the benefit of a year's thought, and there is no chance for the scale to be turned by a mistake or a lucky hit, as is the case in the nervous haste of the ordinary competition.

The problem is a continuous one. That is to say, the subject chosen for this year is a large modern house, supposed to be built by "a progressive and public-spirited citizen, proud of his Philadelphian lineage, and a punctilious respecter of the traditions of his native town." The first competition is in the nature of a preliminary sketch demanding a general layout of the grounds. The competitions immediately following are for plans and elevations of the house, to be judged irrespective of the previous judgment on the grounds, for the stable and such other outbuildings and accessories as the competitor may care to amplify, and details at ¾ in. scale of the most important architectural elements of the design. The final competitions permit a complete revision by the competitor of his original scheme, embodying all the ideas he has gained during the year, requiring a carefully rendered plan and bird's-eye-view perspective of the entire estate.

It is interesting to know that thirteen designs were submitted in the second competition, which has just been decided. This is a novel program, and one which reflects a great deal of credit upon the club. The outcome will be watched with much interest. Most of our competitions are so spasmodic that they do not always afford a fair test of work, especially when that work is to be done by students, and the final outcome of these seven competitions ought to be the selection of a thoroughly equipped man.

ONE of the first fruits of the formation of the Architectural League of America is a code of competitions which we have received from the secretary, which has been adopted by several of the architectural societies. If all competitions were fair to both parties, and the decision of the jury could be depended upon as honest or as affording a selection of really the best design, there would be little necessity for codes. Even with the best rules, however, competitions often go awry, but certainly this code is as precise and free from unnecessary restrictions as one could wish. In the main the conditions are essentially the same as those which have been recommended by the American Institute of Architects. We notice, however, one feature which permits a jury to call in additional disinterested experts, and also the promoter, to advise with them. The essence of the code is contained in the second portion defining and explaining the program. This is as follows: —

The program is an agreement, the terms of which must be carried out in good faith by all parties.

The terms of the program are to be concisely stated and must be mandatory.

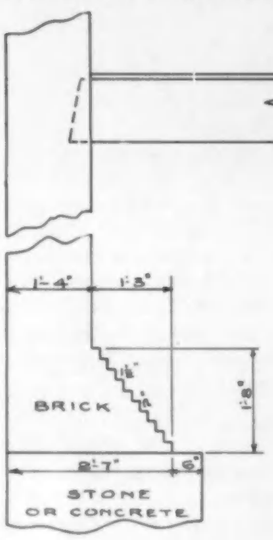
The program shall (*a*) Be headed substantially as follows: "Under the General Code Governing Competitions in Design of the Chicago Architectural Club, of which a copy is subjoined, [Name of Promoter] invites competitive proposals upon the following program": — (*b*) Contains a definite statement as to proposed cost. (*c*) Contains a definite provision as to anonymity. (*d*) Name the jury, which must include experts upon the subject under consideration. (*e*) Fix uniform requirements for drawings, models, or other forms of proposals. (*f*) Fix a definite time and place for receipt of drawings, models, or other forms of proposals. (*g*) Fix the nature or amount of the awards or prizes. (*h*) Fix the period of time within which decision will be rendered. The balance of the code relates to definitions, drawings, models, and the jury.

Foundations for Buildings.

BY HENRY W. HODGE, C. E.

IT is evident that no part of a building is secure unless it is on a thoroughly secure foundation, and, therefore, it is of the first importance that this matter receive the most careful attention from the architect or his engineer.

For the ordinary residence or small building, the weight to be carried on the foundation is so uniformly distributed and of such small magnitude that the ordinary footings under the thicknesses of walls required are amply sufficient to carry, on any ordinary material, and, therefore, this problem has not been a difficult one till recent years; but the advent of very tall buildings with concentrated loads of varying magnitudes has so complicated the problem and increased the difficulties of making a safe foundation that it has become one of the architect's most difficult undertakings, and generally requires the advice and services of an engineer experienced in such matters.



SKETCH No 1

FOOTED OUT WALL

It is not my purpose to try to cover in this article the entire subject of foundations, which is a very broad one, but only to give a few ideas of what should generally be done, and of still greater importance, what should not be done, with a few examples of modern foundations; as these points will, I trust, be of assistance in ordinary cases; and in special cases of great magnitude no directions can be given other than to employ the best and most experienced engineer possible, as every foundation must be designed to meet the local requirements and seldom can one be exactly patterned after some previous one, and one cannot be too careful to get a perfectly secure foundation even if it does seem expensive, as almost any other portion of a building can be strengthened if found insufficient; but an insufficient foundation means a permanently insecure building, and seldom can it be remedied at anything like a practical cost.

The simplest foundation is the ordinary footed-out wall, as shown on Sketch No. 1, and it has become so customary to foot out all on one side, as here shown, to prevent encroaching on adjoining property, that some architects think a uniform pressure is thus brought to bear on the material under such footing, and the writer has often been asked to state "what is the average pressure, and where is its center of gravity."

The supposition that this footing gives a uniform pressure is entirely erroneous, as it does not; since the center of pressure is directly under the center of gravity of the wall above and the floor loads resting thereon, or practically under the center of the wall, so to get an absolutely uniform pressure the footing should be either footed out on both sides of the wall equally, or not footed out at all, as it is evident the center of the loads is fixed practically at the center of the wall, and the shape of the footing cannot possibly change this line of loads; so that the unbalanced portion of the footing, if it gets any pressure at all, must have a moment around the center of loads, and thus tends to "bulge" the wall above.

While for these reasons the above footing is not theoretically correct, it can safely and properly be used in some cases, as within limits, the wall will be strong enough to stand the bending moment and thus to some extent distribute the load on the unbalanced footing; but it is impossible to exactly compute the distribution of pressure on the footing, and this form of footing is not recommended for heavy loads, and never for a projection of more than the thickness of the superimposed wall.

It is, therefore, well wherever possible to foot out walls equally on both sides from the center of the walls, and where the bearing material is earth these footings should be wide enough to keep the pressure on the footings between 2 and 4 tons per square foot, depending on the nature of the material, though 4 tons is as high as should be put on any earth.

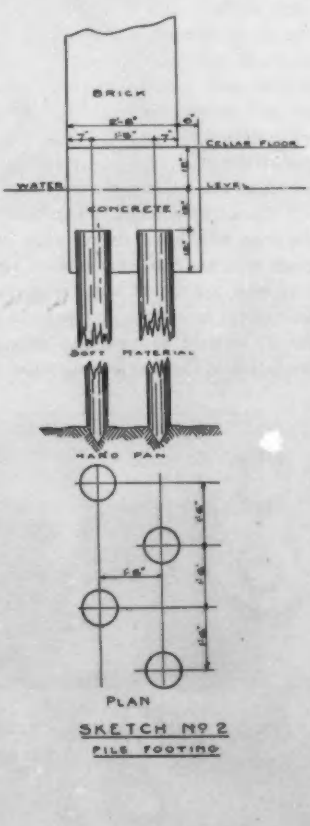
Footings are often made of rough rubble masonry, but the author much prefers concrete, as this can be shoveled in and rammed to completely fill the trenches, and if made of good Portland cement it will set as a solid monolith and be much better than stone footings. These concrete footings should not be less than 12 ins. thick, and thicker for very heavy loads, and they should project about 6 ins. beyond the face of the wall above.

On these footings brick or stone foundation walls may be built, though brick is the better material, and if stone is used the walls should be at least 4 ins. thicker than if built of brick. All these foundation walls, and in fact all masonry up to the first tier of beams above the ground level, should be laid in Portland cement mortar, as the dampness of the earth backing keeps Rosendale cement mortar from properly setting.

When the ground is too soft to put a footing directly thereon, piles should be driven and capped with concrete, as shown on Sketch No. 2. These piles should be driven as near as practicable under the wall above and should be staggered in rows, and not be closer than 2 ft. c. to c.

The load allowed on a pile will vary with the nature of the material it is driven in, but in ordinary materials well-driven piles will safely carry from 15 to 20 tons each. If the weight to be carried is so great that enough piles cannot be driven directly below it, and the footings cannot be extended on both sides of the wall, it is best to use some other style of foundation, as it is bad practise to have the center of pressure not practically over the center of the pile supports.

If driving piles through a very soft material underlaid by a hardpan, the piles should be shod with iron and well driven into the hard material, which will hold their points securely while the concrete cap, as shown, will hold the butts and thus make them act as columns even if the surrounding material is very soft. The writer has put in very satisfactory foundations of this character where the upper material was so soft that the pile would settle in it 10 ft. of its own weight, and where hardly any driving was necessary to sink the pile to the hardpan. Piles should be cut off at least a foot below the water level so as to keep them always wet, and timber capping is to be avoided, as it is liable to rot, and does not as securely hold the pile heads as concrete filled in around the piles for a depth of 1 ft. at the top, as here shown.



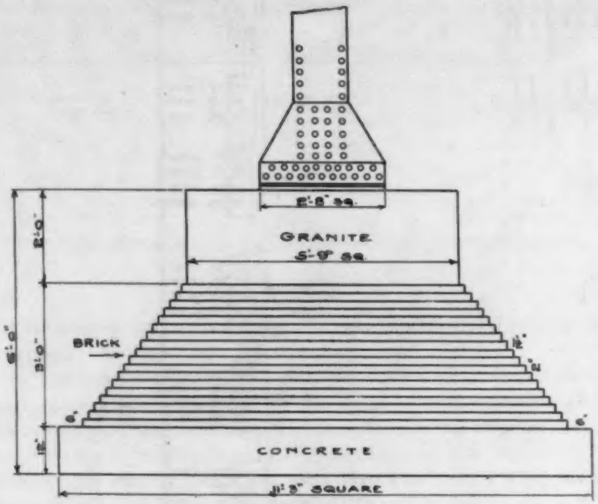
SKETCH No 2

PILE FOOTING

Where the rock is within 20 or 25 ft. of the cellar bottom it is far better to excavate the intervening material and found on the solid rock, as this depth of material can readily be held

by 3 in. tongued and grooved sheet piling driven down by hand and supported with breast timbers as the excavations go down, and for a building of any importance it will pay better to do this excavating than to run the risk of unequal settlement and consequent cracks in the building.

When excavating deep trenches of this kind for walls, a considerable saving may be effected by simply running down piers to the rock and arching over or resting steel beams from pier to pier just below the cellar floor, making the cellar wall continuous. These piers will, of course, have to be of sufficient area to stand the crushing effect of the loads to be carried, and the front and rear piers will



SKETCH No 3.

BRICK FOOTING FOR COLUMNS

also have to be designed to stand the thrust of the end arches, if arches are used.

If the rock is inclined at much of an angle to the horizontal it should be leveled off or stepped off in horizontal steps before putting in the foundations, so as to do away with the tendency to slip.

A cheap and satisfactory foundation for light structures in very wet and soft ground can be made by putting in what is known as a "scow bottom," which is nothing other than building a regular timber scow with sides and ends 12 to 16 ins. thick, and 3 or 4 ft. deep, and bottom of two thicknesses of plank 3 to 6 ins. thick, calked all around and sunk in the soft bottom. The brick walls are built directly on the sides and ends, and the whole structure thus literally floats in the mud. If the building is of any width there must be a sill timber with a line of columns thereon supporting the floors parallel to the side walls and holding down the bottom planking against bulging. A large number of old warehouses near the water front in New York are founded in this way, and have stood without serious settlement.

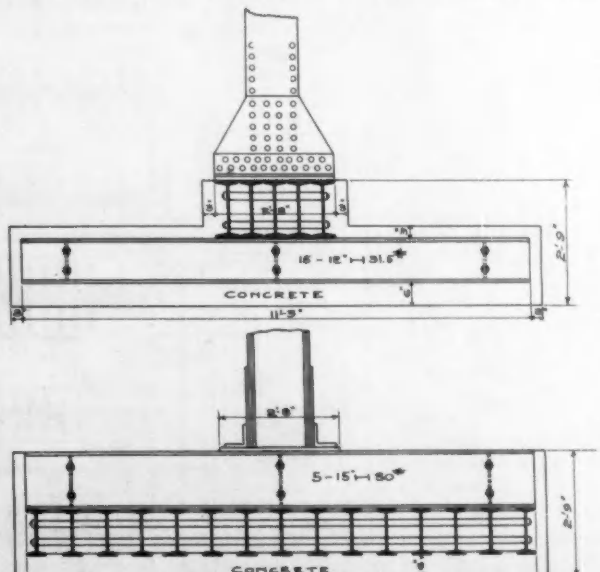
The above-mentioned foundations cover about all the cases for direct wall footings, and if sufficient bearing cannot be obtained by any of these means it will be necessary to resort to some means of extending the area of foundations, and yet keeping the lines of pressure directly over the center of such areas; this can be done by using steel beams and girders, so arranged as to deliver the loads exactly where and in such proportion as is desired. In the modern tall building the loads are not delivered to the foundations uniformly, nor are they generally on continuous walls under which footings of any of the above-mentioned forms can be placed, but they are generally delivered by isolated columns more or less irregular as to position and varying greatly in amount, and it is necessary to so arrange the foundations that each and all of these loads will be delivered centrally over its foundation, and that the pressure per square foot will be uniform for all footings regardless of the actual loads on the various columns.

This question of equal unit pressures under all footings is of the greatest importance, as the neglect of it causes serious trouble, due to unequal settlement, and the writer lately inspected an ordinary five-story building where the footings had been so designed that the pressure under the exterior walls was $1\frac{6}{10}$ tons per square foot, and under some of the interior piers supporting the floors $4\frac{3}{10}$ tons per square foot; and, naturally, the piers had settled so much more than the walls that the floors were badly out of level, and great damage had been done to the building throughout, which could only be remedied by shoring up the interior of the building, removing the center piers, and putting larger footings under them.

A still more serious example of the trouble caused by neglect of this important requirement was the United States Government Post Office and Custom House in Chicago, built in 1877, and now being replaced because it absolutely fell to pieces, entirely through the fault of improperly designed foundations.

The architect founded this building on one continuous layer of concrete about 3½ ft. thick overlying the clay, and as some portions of the building were much heavier than others, a very unequal settlement due to the unequal unit pressures took place, and parts of the building settled nearly 2 ft., while other portions hardly settled at all, and this made a complete ruin of the building, and it had to be pulled down.

That this trouble was simply due to the inequality of the pressures, regardless of the soft material on which it was built, is shown by the action of buildings properly founded on the softest material, of which a notable example is seen in the United States Government Custom House at New Orleans, which is founded on piles driven in soft mud, and the entire building has settled considerably; but as the number of piles were properly proportioned for the loads to be carried, the settlement has been uniform throughout and the floors are still level, and no serious cracks or other serious defects have developed, and the building is still as good as ever. So that if the footings are so designed as to give uniform pressures, it is not a very serious matter if some settlement does take place, as it will cause no trouble, and where the bearing strata is clay or other compressible

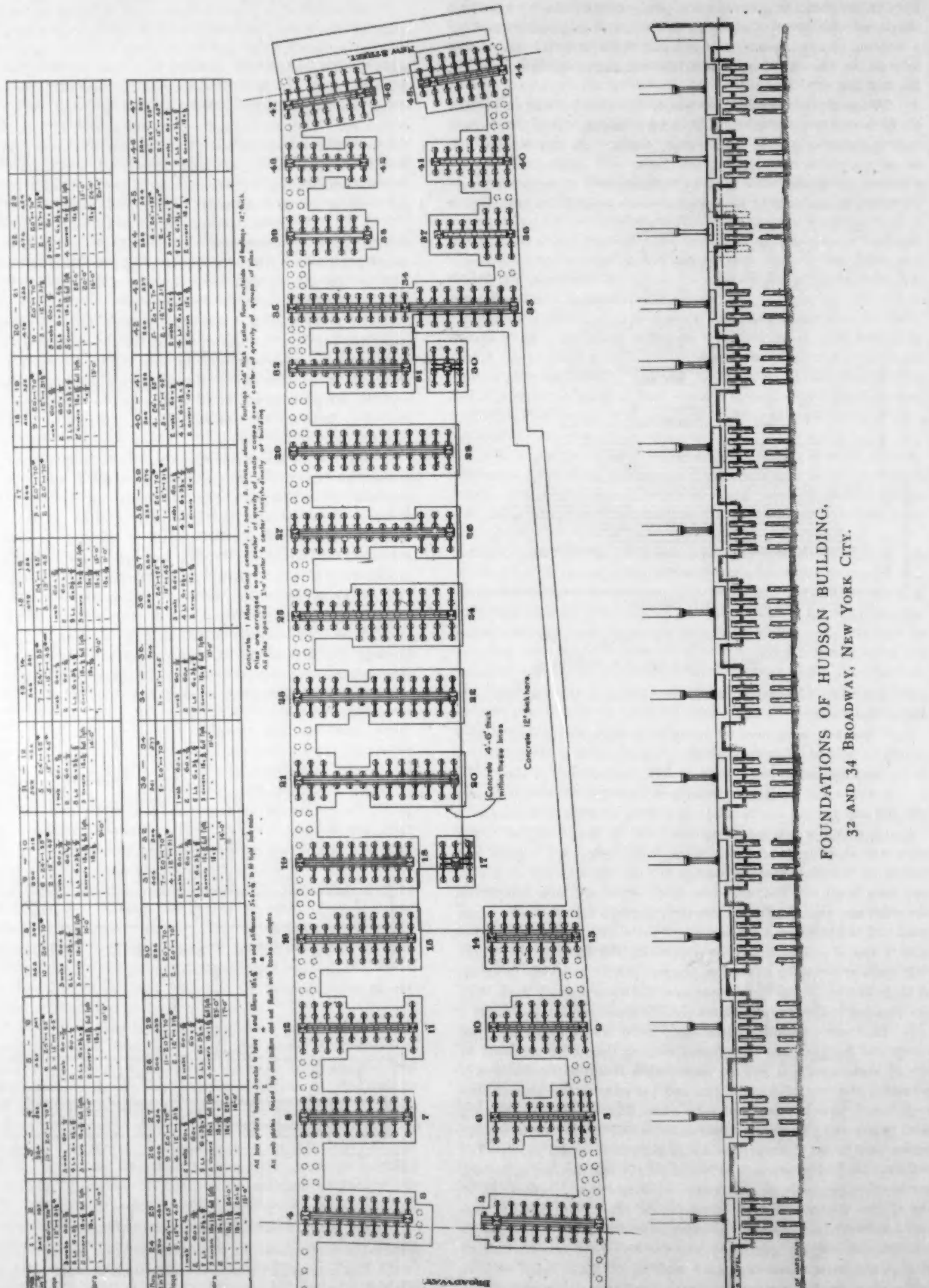


SKETCH No 4.

FOR STEEL COLUMN FOOTING.

material a certain amount should be allowed for and expected, as on the clay bottom of Chicago the settlement is found to be about an inch for each ton per square foot of pressure, though this settlement reaches its maximum at the end of about one year.

If footings can be built out on all sides of the applied load, it is

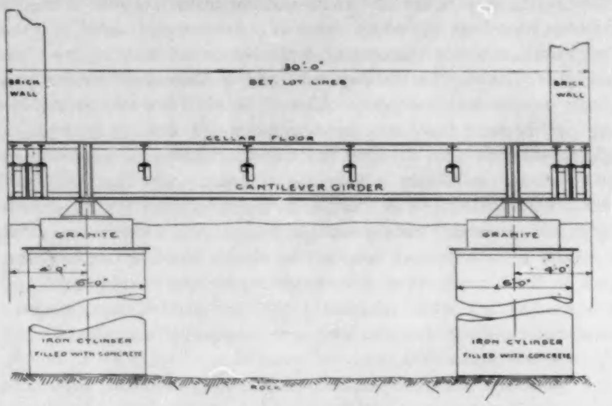


FOUNDATIONS OF HUDSON BUILDING,

32 AND 34 BROADWAY, NEW YORK CITY.

a very simple matter to spread the foundation pier, and thus bring the bearing pressure to the value desired. The old method of doing this was by building brick piers, as in Sketch No. 3, but this method has generally been replaced by getting the necessary spread by steel grillage, consisting of two or more layers of rolled beams or rails embedded in concrete, as shown on Sketch No. 4.

Sketches Nos. 3 and 4 are two different designs for the footing



SKETCH No 5

of an interior column carrying 500 tons, resting on a good earth bearing.

The first advantage of the grillage footing is its decreased depth and volume, as the room in the basement of modern buildings is almost as valuable as in any other floor, so that it is of great advantage to take as little room out for foundations as possible, and it is readily seen that the large brick piers shown on Sketch No. 3 would be much more objectionable in a cellar than the footing shown on Sketch No. 4, or if it were desired to put the entire footing below the cellar floor, the footing shown on Sketch No. 4 would take much less excavation than the brick footing.

The second advantage of the grillage footing is its greatly decreased weight, and the weight saved by such footings will sometimes be sufficient to compensate for adding another story to the building.

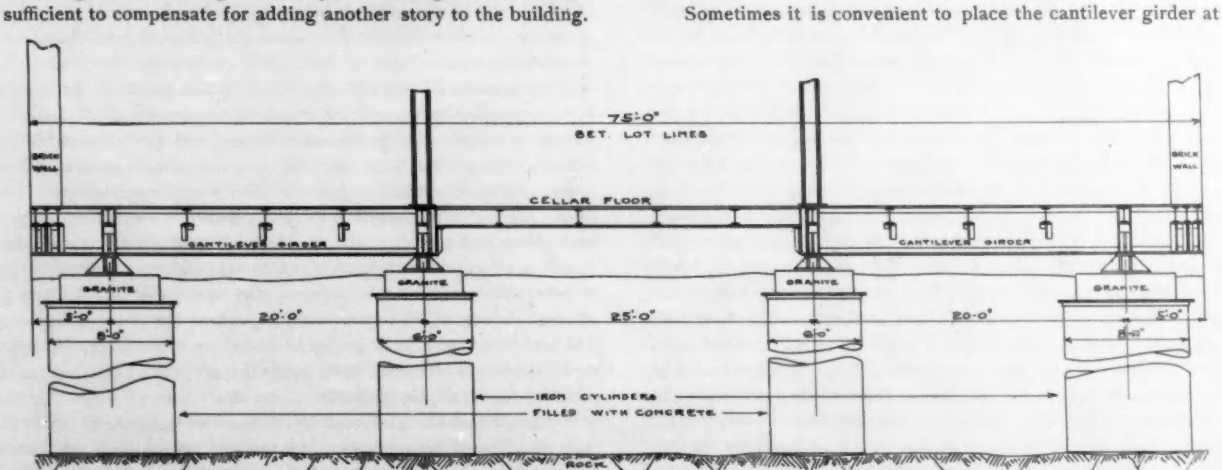
Grillage foundations need not be made square, as the tiers of beams can be arranged in any shape desired, and this style of footing is readily adapted to whatever requirements are met. A good example of the use of grillage beams resting on piles is shown on the drawing of the foundations for the Hudson Building, 32–34 Broadway, New York.

Here we had a very soft bottom overlying the hardpan and rock, and designs were made both for pneumatic caissons carried to the rock and for a pile foundation, as shown, and it was found that this foundation would cost only one third as much as the caissons supporting cantilevers.

The groups of piles under two adjacent columns were so spaced that their center of gravity was under the center of gravity of the applied loads, and after driving the points of the piles well into the hardpan the heads were cut off even below the water level, and concrete was filled in around same. On this concrete the longitudinal grillage beams were placed, and the two column loads were distributed to these grillage beams by the riveted transverse girder. This arrangement of two columns on one footing is often followed on a smaller scale where the large girder here used is replaced by rolled beams. By this method the weight from the wall columns can be most economically distributed evenly over the footings without encroaching on the adjoining property.

In cases where none of the above-mentioned foundations can be used, and where one cannot extend footings beyond the lot lines, it becomes necessary to use cantilevers to support the wall columns; and while this method of founding has been used quite extensively, it is the most expensive foundation in use, and should only be resorted to where absolutely necessary. This principle can be used in a variety of ways, but in general it consists in sinking caissons well within the lot lines to the solid rock, and supporting cantilever girders on the cassions extending out to the walls for the support of the wall columns, as in Sketch No. 5. If, however, the building is wide it may be necessary to sink more caissons, as in Sketch No. 6. These caissons may be round or square, and built of wood or steel, and their size must be proportioned for the loads they are to carry, and they may be sunk either by the pneumatic process or open excavation.

Sometimes it is convenient to place the cantilever girder at the



SKETCH No 6.

Still another advantage of grillage foundations is the rapidity with which they can be procured and put in place, as the large granite base stones, shown on Sketch No. 3, take considerable time to be quarried, cut, and delivered, and the handling and setting of such heavy pieces is slow and troublesome, whereas grillage beams can be secured immediately, and the individual pieces are easily handled and set.

These grillage foundations are somewhat more expensive than brick piers, but the advantages named above more than compensate for the increased cost.

first floor above the cellar, in which case it is only necessary to put columns on the caissons extending through the cellar, and place the cantilever girders on the tops of these columns.

The above-mentioned forms of foundations cover the most general cases, though they can be varied greatly in the details of application, as every case must be studied as to its local requirements, always bearing in mind the two fundamental principles, that the center of loads should be over the center of foundations, and that the area of each foundation should be in exact proportion to the load to be carried.

Fire-proofing.

FIRE-PROOF CONSTRUCTION OF BUILDINGS IN THE UNITED STATES.— *Continued.*

BY R. W. GIBSON (NEW YORK).
(Read before the Royal Institute of British Architects.)

AS the floor arch determined the distance apart of the floor beams, so it next regulated the distance apart of the girders. The span of the arch is indicated by its own working strength, and the depth of the beam is indicated by the thickness of the arch, because any considerable difference would have to be made up by concrete filling upon the top of the arch, which would be more expensive than the arch material itself. Then the depth of the beam having been determined within reasonable limits, its economical span is easily ascertained. This proves to be somewhere between 14 and 18 ft., which is the working distance between the main girders, and which, being a convenient size for a single office, is also taken as the unit of room width and the space allotted in the outer walls to a pair of windows. The distances will, of course, vary according to the floor loads adapted for different purposes; those mentioned apply to buildings having floors weighing from 75 lbs. to 95 lbs. dead load per foot and supporting live loads from 75 lbs. to 150 lbs., which are the usual limits for offices.

As soon as the rough steel frame is completed and the floor arches are all in, the outer walls are usually half-way up, and the roof can be given its final covering. It is constructed with arches, the same as the floors, except that sometimes the steel beams are laid to the necessary pitch of about half an inch to the foot, so as to avoid the weight and expense of filling, which would be necessitated by level beams and arches. Sometimes an intermediate floor is temporarily converted into a roof, so that the stories below it can be enclosed and warmed and finished. The walls need not be described in detail here, as they present no novelty in a building of the class under discussion. In general practise their thickness is made about two thirds of the full thickness required for walls supporting the floor loads, and they are secured to the metal framework so as to receive its assistance in resisting horizontal wind pressure; but, as before mentioned, they are built around the columns in such way as to permit of their unequal settlement. The walls containing many windows are not usually considered as walls, but rather as a series of piers and panels, whose thicknesses will be regulated by their self-supporting strength, and by requirements of architectural appearance. As examples of thickness the following may be mentioned: a wall 150 ft. high, divided into ten or twelve stories, would have thicknesses of 16 ins., 20 ins., 24 ins., and 28 ins., in about four equal sections of its height for massive buildings; while for skeleton frame buildings with walls supporting only their own weight the thicknesses might be 12 ins., 16 ins., and 20 ins., in three divisions; and for cage construction, with every story of walls supported separately on the frame, 12 ins. throughout would be good practise. The New York law stipulates, for skeleton or cage construction, that the walls shall not be less than 12 ins. for the uppermost 50 ft., 16 ins. for the next 50 ft. of height, and so on downward, adding 4 ins. to each successive 50 ft., this being required in a law influenced strongly by the fire department for the sake of the stability of the masonwork itself. It is doubtful, however, whether it is worth while to urge greater thickness of wall below than above in a structure of pure cage skeleton type, unless exposed on one side to heavy fire risk from a combustible building, against which a well-built hollow wall with considerable mass of material is no doubt the best safeguard; yet, even here, 16 ins. of brickwork, in two thicknesses of 8 ins. each, would be relied upon to withstand any fire with the assistance likely to be rendered. The thickness of material necessary to resist the weather is found to be 12 ins. at least of brickwork with terra-cotta interior furring.

Furrings are used in all American buildings, even of the cheapest class, to afford a dry and warm base for the finishing plasterwork; in cheap buildings they are light strips of pine, 2 by 1, nailed to the brick wall, which receives the lathing, just as the quarters or studs of a partition. In fire-proof buildings the furrings are hollow terra-cotta slabs or tiles, 2 ins. thick, and 16 ins. by 8 ins., or other convenient sizes, built up against the inside face of the wall and secured with iron where necessary; sometimes, to save space, furring blocks of hollow terra-cotta are made the customary size of bricks, and the innermost 4 ins. of the wall is built of these bonded with the brickwork, and this is permitted in the New York building law; but the protection against driving rain and condensation internally in damp weather is not so good. The efficiency of the wall as a clothing to the metal has been variously estimated, some authorities requiring that at least 8 ins. of brickwork or similar material should cover all iron to protect it from moisture and fire. The New York law permits a minimum of 4 ins., and there is no proof that it is insufficient, if reasonable care is exercised to prevent a concentration of moisture or heat at such a spot. It should be observed, however, that in the United States it is customary for every building to possess its own side walls independently of its neighbor, so that where important buildings actually join there are usually two walls to resist the transmission of fire; party walls are rare.

Assuming, therefore, that all the steelwork has been externally covered with masonry, affording from 4 to 8 ins. protection, the interior of the steel frame is protected in another fashion: this is, briefly, the extension over all of its exposed surfaces of the 2 ins. of terra-cotta furring before mentioned. In some places a greater thickness than 2 ins. is used, and urged, and where risk of great heat occurs it is undoubtedly wise; but a minimum of 2 ins. of hollow tile with 1 in. of plaster has been demonstrated to be thoroughly effective, if well secured, in any fire likely to occur in residence or office building structures; 3 ins. for ordinary and 4 ins. for dangerous storage may be considered good. First, all the iron posts and columns are covered, those next the walls usually to form square pilasters by the use of rectangular 2 in. slabs, and the columns standing clear by means of segmental blocks with flat backs and with circular fronts fitted to the columns so as to give a circular finish over the square steelwork. It may be noted here that most of the steel column work is formed of sections which give an approximately square column, and occasionally the column finish of terra-cotta is also square, but not often. The preference shown for square column sections is undoubtedly based on the facilities for splicing superimposed lengths, and for attaching the angles and brackets required to support the girders and beams, and on the possibility of bringing the girder load upon the column near to its axis so as to avoid undue eccentricity of load. For moderate loads the Z-bar column is a great favorite for these reasons. Supporting eight or ten stories, however, the box riveted with plates and angles offers equal or greater advantages, while for the lightest loads a latticed channel column is most economical and adaptable; all of these are square columns. The round columns, such as the Phœnix segmental and certain octagonal and polygonal columns, while theoretically perfect, as columns, are difficult to assemble, and afford only imperfect facilities for attaching girder brackets, struts, etc.

The girders are protected by slabs of terra-cotta, as before described, secured with hooks and bars and wiring, and are usually given their outer form by means of metal lath upon light iron bracketing to receive the finished plastering, thus permitting uniformity of appearance in the ceiling design, while the girders within are of sizes varying according to their span and load. The soffits of the common joists or floor beams are protected, as has been before remarked, by the lower surface of the floor arches extending beneath them. All the steelwork thus covered is plastered; the rough coat being utilized to correct the form, and the final coats being frequently one of the exceedingly hard patent plasters which have become popular of late years. The lower portions of walls and columns are frequently finished with marble slabs, 1 in. thick, or with tiling, which is certainly an additional protection against the disintegrating effect

of the water, even when not of much value against fire. In work where economy is urgent, and a lower standard may be tolerated, all the iron is protected by a covering of metal lathing, and a heavy coat of cement scratched and finished with ordinary plastering; but this is liable, as has been seen, to be damaged by water, and is insufficient in its actual mass.

There is a good deal of difference of opinion with regard to air spaces within the fire-proofing, and great value is clearly proved for air spaces such as those afforded by hollow terra-cotta, which may be described as numerous and discontinuous, that is, affording no regular and extended communications; but it is clear that large and connected air spaces may, and probably will, act as flues when broken into, and actually draw flame and heat into places where it is most harmful. For this reason those methods are preferable which place the fire-proofing material close to the metal and preserve numerous and frequently broken air spaces in their own substances, rather than those which, standing away some distance from the metal, leave it liable to attack inside of the protection.

The greatest need of improvements in fire-proof work is the bringing up of the lower grades to the level of the higher by a system of insurance inspection, or something of the kind, which will present in tangible form, to a certain class of owners, the value of good work which they do not themselves understand. There is a tendency in all building, and at all times, to put inferior work in places where it is soon covered up, and in fire resistance we have been working on so small a margin that there is little chance of doing this without injury.

After the structural steel is all protected the partitions are built; these are of various patterns, the best being undoubtedly the terra-cotta blocks, 4 ins. thick for average heights, 3 ins. for moderate heights, and 6 ins. for great heights of story. They are occasionally stiffened with angle iron framing, when so cut or thinned as to be weak, but they show an extraordinary strength when well set, as they usually are, in Portland cement. Minor partitions, subdividing large rooms, and sometimes all the partitions except those next corridors, are frequently built by using light angle iron posts or quarters covered with metal lath, and plastered either like the old-fashioned wood plastered partitions, or with very thin posts and one sheet of metal lathing only, so as to make a solid plastered partition about 2½ ins. thick, which works very well, although a 3 in. tile partition will dry quicker and cost only a little more. Either of them will resist the passage of fire from one room to the next under ordinary circumstances.

When a building reaches the stage here described, that is to say, when it is ready for the joiner's work, it is probably more fire-proof than at any other time. It has practically nothing combustible in its construction. The tendency to-day is to reduce more and more the amount of woodwork admitted after this stage in finishing, and to substitute fire-resisting materials in places where it has hitherto been thought impossible; not only doors and sashes, but even glazing and office furniture, can now be obtained of fire-resisting character, and their use is of very great value. A building of first-class fire-proof construction, such as is found in New York, ten years old, to-day can, and occasionally does, become the scene of a very violent conflagration. Several such have occurred, and although with the aid of the fire department they have been subdued before spreading beyond the rooms where they started, yet the amount and character of the damage done sufficed to point out the need of much greater strictness in selecting building materials. Consider the quantity of fuel present in an active lawyer's office in two or three rooms; there will be six or eight desks, two or three hundred feet of book and document shelving, beside chairs and tables, and other customary furniture. As usually built, the roll-top desk is a perfect fire trap laid for ignition, and often the waste-paper basket is placed beneath it and filled with paper ready for the match which is dropped in by some careless smoker. Several fires have originated in just this way. When once started it is soon discovered that the amount of fuel present makes a fire which exceeds the control of the tenants and janitors. Possibly there is a wooden panel partition dividing one of these offices from the next; in any case, there are almost surely wooden doors with wooden architraves and jambs, and with glass panels, and, if the building is not of very recent date, possibly some wooden wainscoting and window paneling. The wooden floor may be pardoned, because it is rarely that fire reaches it; the natural draft upward in the supply of cool air from the bottom seems to protect the floor for a long time, and then when the water is poured into the room the floor is naturally again most protected. But all the other woodwork above mentioned should be banished in a building claiming to be fire-proof.

The doors and architraves should be of sheet metal: wood cores must still be tolerated; such are already upon the market, and have been used long enough to demonstrate their practicability. The window architraves and jambs should be of hard plaster, and the window frames and sashes of chemically treated fire-proof wood or of metal. The borrowed lights in the internal partitions generally used to light the interior corridors should have similar sash and trim, and these and the doors should have wired glass, which is also a demonstrated success in its ability to hold together and check drafts of hot air and flame, before which ordinary glass disappears. The outside glass windows must probably be tolerated in large panes of plate and sheet glass, because the value of the light and view doubtless exceeds the price paid for it in extra risk. As to the furniture, a really first-class office pretending to be fire-proof, such as that of a large bank or public department, can and should have metallic book shelving, and desks, and cabinets, letter files, etc., all non-combustible, even though they scarcely claim to be fire-proof in the same way that a safe is so made. It is of great importance that such things do not add to the fuel in the critical moment when the fire is commencing. The desks and tables may have wooden tops upon metallic frames and pedestals — in other words, the wood may be reduced to such a minimum quantity that the risk is almost nothing. Of course there remain the papers, books, implements, etc., but this risk can be taken care of by the fire hose of the building.

Every first-class building should have, and in New York does have, a number of private fire hoses so distributed that every part of the building can be reached by one of them. They are of small diameter — about two inches — and are supplied by a large tank on the roof, and frequently by an auxiliary pump in the machinery department in the basement, in case continued use is required. As it has sometimes happened that the water has failed by reason of the main being found shut off when wanted, it is undoubtedly best that the fire main should also be the chief distributing main of the building; its extra size will be no harm, but the water will be always there ready for use. Such an apparatus has nipped in the bud many an incipient fire, and with this, and the care above mentioned as to materials, a building may really claim to be fire-proof. A few buildings come almost up to this standard of protection. The use of the fire-proof doors and architraves and wired glass is yet rare, but in all other respects a high standard has been reached. One may walk into a new banking room and find it difficult to discern any combustible material in sight, except the desk tops and the window sashes; even the floors are very frequently of mosaic or some ornamental cement composition or marble, although, as before remarked, the wood floor is the smallest risk. Even in ordinary fire-proof buildings, where offices or apartments are rented, the halls, stairs, and corridors, and elevator shafts are entirely incombustible. Something remains to be desired in the protection of the staircases from flame at their soffits, because they are usually built of iron strings or carriages with marble treads all visible beneath, and, as will be shown later, fire may be carried to them from very distant points; still, the complete banishment of wood from these departments is of value. But it is true that the ordinary so-called fire-proof building still retains too much wood; what is most needed is the bringing up of this class to the higher standard; the expense is not very great, and would, no doubt, be covered by saving in insurance and risk.

(*Continued.*)

VERTICAL AND HORIZONTAL BRICK COURSES.

BY D. A. HEWITT.

THOSE whose duty it is to determine the sizes of piers and walls to work bond, know the great amount of work necessary to determine the exact dimensions of the brick and to compute the number of brick courses and the mortar joints to suit a particular space.

The draftsman who carefully works his plans to a small scale will appreciate the advantage of having the figures to plot the openings to correct widths and heights by means of "universal ready calculated" tables always at his convenience, saving the time of figuring out the face brick quantities, which otherwise would have to be done for each separate set of plans that are drawn. Then when the large detail drawings are being executed in the office, it is often necessary to have window and door frames, stonework, brick piers, panels, string courses, or terra-cotta panels bond into the brickwork. The question arises, "How will this work bond?" and if this information is ready at hand and can be figured correctly on the drawings, the architects' work has a more practical and matter-of-fact appearance to those who construct the building from having courses in heights and bonding lengths marked upon the details.

The accompanying tables present all of this information. The figures are not simply of local value, but are suitable for any part of the country. After determining how high four courses will gage and deciding whether it be a fine or coarse mortar joint, it is only necessary to look down the extreme outside columns to the figure 4, then passing to the right or left across the table to any one of the columns under the heading of common or pressed brick numbered from one to six, till the reading of such table suits the description of work under discussion. Having chosen the column, then all calculations throughout the job are based from it for the face work.

The size of all common bricks varies considerably in each lot according to the clay and the proximity to the fire at burning, the hard bricks being from ⅛ to ¼ of an inch smaller than the salmon brick. Pressed brick manufacturers use the same size molds, consequently the face brick are more uniform in size. In using this table only two quantities have to be decided upon: first, the size of brick; and second, the amount of mortar to a joint.

The same application and use of the tables can be made to old work being measured up as are used in new buildings. In surveying existing structures for alteration or additional work, it is easy to record what four courses equals in height (which in any event is a useful note to take), and thus depend upon all measurements in brick courses to plot the drawings by.

TABLE OF VERTICAL BRICK COURSES.

GIVING THE NUMBER OF BRICK TIERS OR FIGURED RESULTS OF THEM.

Number of Vertical Courses.	Pressed Brick. 1st. Feet.	Inches.	Fractions.	2d. Feet.	Inches.	Fractions.	3d. Feet.	Inches.	Fractions.	Common Brick. 4th. Feet.	Inches.	Fractions.	5th. Feet.	Inches.	Fractions.	6th Feet.	Inches.	Number of Vertical Courses.
1		2	5-8		2	11-16		2	3-4		2	7-8		2	15-16		3	1
2		5	1-4		5	3-8		5	1-2		5	3-4		5	7-8		6	2
3		7	7-8		8	1-16		8	1-4		8	5-8		8	13-16		9	3
4		10	1-2		10	3-4		11			11	1-2		11	3-4	1	0	4
5	1	1	1-8	1	1	7-16	1	1	3-4	1	2	3-8	1	2	11-16	1	3	5
6	1	3	3-4	1	4	1-8	1	4	1-2	1	5	1-4	1	5	5-8	1	6	6
7	1	6	3-8	1	6	13-16	1	7	1-4	1	8	1-8	1	8	9-16	1	9	7
8	1	9		1	9	1-2	1	10		1	11		1	11	1-2	2		8
9	1	11	5-8	2	0	3-16	2	0	3-4	2	1	7-8	2	2	7-16	2	3	9
10	2	2	1-4	2	2	7-8	2	3	1-2	2	4	3-4	2	5	3-8	2	6	10
11	2	4	7-8	2	5	9-16	2	6	1-4	2	7	5-8	2	8	5-16	2	9	11
12	2	7	1-2	2	8	1-4	2	9		2	10	1-2	2	11	1-4	3		12
13	2	10	1-8	2	10	15-16	2	11	3-4	3	1	3-8	3	2	3-16	3	3	13
14	3	0	3-4	3	1	5-8	3	2	1-2	3	4	1-4	3	5	1-8	3	6	14
15	3	3	3-8	3	4	5-8	3	5	1-4	3	7	1-8	3	8	1-16	3	9	15
16	3	6		3	7		3	8		3	10		3	11		4		16
17	3	8	5-8	3	9	11-16	3	10	3-4	4	0	7-8	4	1	15-16	4	3	17
18	3	11	1-4	4	0	3-8	4	1	1-2	4	3	3-4	4	4	7-8	4	6	18
19	4	1	7-8	4	3	1-16	4	4	1-4	4	6	5-8	4	7	13-16	4	9	19
20	4	4	1-2	4	5	3-4	4	7		4	9	1-2	4	10	3-4	5	0	20
21	4	7	1-8	4	8	7-16	4	9	3-4	5	0	3-8	5	1	11-16	5	3	21
22	4	9	3-4	4	11	1-8	5	0	1-2	5	3	1-4	5	4	5-8	5	6	22
23	5	0	3-8	5	1	13-16	5	3	1-4	5	6	1-8	5	7	9-16	5	9	23
24	5	3		5	4	1-2	5	6		5	9		5	10	1-2	6		24
25	5	5	5-8	5	7	3-16	5	8	3-4	5	11	7-8	6	1	7-16	6	3	25
26	5	8	1-4	5	9	7-8	5	11	1-2	6	2	3-4	6	4	3-8	6	6	26
27	5	10	7-8	6	0	9-16	6	2	1-4	6	5	5-8	6	7	5-16	6	9	27
28	6	1	1-2	6	3	1-4	6	5		6	8	1-2	6	10	1-4	7		28
29	6	4	1-8	6	5	15-16	6	7	3-4	6	11	3-8	7	1	3-16	7	3	29
30	6	6	3-4	6	8	5-8	6	10	1-2	7	2	1-4	7	4	1-8	7	6	30
31	6	9	3-8	6	11	5-16	7	1	1-4	7	5	1-8	7	7	1-16	7	9	31

EXAMPLE.—To ascertain the measurement of a number of vertical brick courses, including mortar (according to the thickness of joint and size of brick), select a table nearest to the quality of work required and read the corresponding figures.

AMERICAN FACE BRICK.

IN HORIZONTAL OR STRETCHER BRICK COURSES.

Giving the number of bricks or figured results.

New England, Common. 7¾ x 3¾ x 2¼ Mortar Joint ¼ in. (Common Brick.) Feet.	Inches.	Fractions.	"Standard," Common. 8¼ x 4 x 2¼ Mortar Joint ¼ in. (Common Brick.) Feet.	Inches.	Fractions.	Western States, Common. 8½ x 4⅛ x 2⅜ Mortar Joint ¼ in. (Common Brick.) Feet.	Inches.	Fractions.	COPYRIGHTED, 1899, BY D. A. HEWITT, TORONTO.	Pressed Brick. 8⅜ x 4⅛ x 2⅜ Mortar Joint $\frac{3}{16}$ in. (Pressed Brick.) Feet.	Inches.	Fractions.	"Standard," Pressed. 8⅜ x 4⅛ x 2¼ Mortar Joint ¼ in. (Pressed Brick.) Feet.	Inches.	Fractions.	Roman or Tile. 12 x 4 x 1½ Mortar Joint $\frac{3}{16}$ in. (Pressed Brick.) Feet	Inches.	Fractions.
	8			8	1-2		8	3-4	1 Brick + 1 Joint.		8	9-16		8	5-8	1	0	3-16
	11	3-4	1	0	1-2	1	0	7-8	1½ Bricks + 1 Joint.	1	0	11-16	1	0	3-4	1	4	3-16
1	3	3-4	1	4	3-4	1	5	1-4	2 Bricks + 1 Joint.	1	4	15-16	1	5		2	0	3-16
1	7	3-4	1	9		1	9	5-8	2½ Bricks + 2 Joints.	1	9	1-4	1	9	3-8	2	4	3-8
1	11	3-4	2	1	1-4	2	2		3 Bricks + 2 Joints.	2	1	1-2	2	1	5-8	3	0	3-8
2	3	3-4	2	5	1-2	2	6	3-8	3½ Bricks + 3 Joints.	2	5	13-16	2	6		3	4	9-16
2	7	3-4	2	9	3-4	2	10	3-4	4 Bricks + 3 Joints.	2	10	1-16	2	10	1-4	4	0	9-16
2	11	3-4	3	2		3	3	1-8	4½ Bricks + 4 Joints.	3	2	3-8	3	2	5-8	4	4	3-4
3	3	3-4	3	6	1-4	3	7	1-2	5 Bricks + 4 Joints.	3	6	5-8	3	6	7-8	5	0	3-4
3	7	3-4	3	10	1-2	4	0	3-4	5½ Bricks + 5 Joints.	3	10	15-16	3	11	1-4	5	4	15-16
3	11	3-4	4	2	3-4	4	4	1-4	6 Bricks + 5 Joints.	4	3	3-16	4	3	1-2	6	0	15-16
4	3	3-4	4	7		4	8	5-8	6½ Bricks + 6 Joints.	4	7	1-2	4	7	7-8	6	5	1-8
4	7	3-4	4	11	1-4	5	1		7 Bricks + 6 Joints.	4	11	3-4	5	0	1-8	7	1	1-8
Common Brick.										Pressed Brick.								

EXAMPLE.—To ascertain the measurement of a horizontal brick wall or piers, including mortar joints, select a table according to the quality of work required, and read results in either bricks or feet, inches and fractions.

By means of the accompanying table the reader, after a little study as to the method of using, may be able to very rapidly apply the amount in bricks or feet, inches or fractions, in place of performing the calculations.

The table of horizontal or stretcher brick courses is entirely different from the vertical table, in that all the quantities are known, and in its use requires only a selection to be made from the bricks manufactured at different parts of the Union and an assumption of thickness of mortar joints.

Internal piers, angles of walls, chimneys, and small bonding surfaces can readily be decided upon as to the number of bricks, or bricks and a half, to be put into them.

When this table is used in conjunction with the table of vertical dimensions, perfect brickwork as to bond will be the outcome.

WATER-PROOFING DAMP WALLS.

IN describing the manner in which bricks may be rendered water-proof and the dampness kept out of walls, a correspondent in one of the London architectural papers suggests that the brick or rough cast wall be saturated with several applications of hot boiled oil or linseed oil in which glue has been dissolved. The latter compound is prepared by soaking the glue for twelve hours until soft, then pouring away the

surplus water and dissolving the soft glue in linseed oil in a glue pot. Another process which may prove satisfactory is to saturate the walls with a strong solution of gelatine in water and before this dries on the wall applying a solution of bichromate of potash. It is claimed that the result, if the wall be an exterior one and exposed to the light, will be a coating of water-proofing gelatine fixed in the pores of the brick or plaster. Still another plan which is suggested is to make a strong solution of good tallow soap in boiling water. Brush this well over the wall or plaster, and before it dries lay on a solution of green copperas or of bluestone, chemically known as sulphate of copper. This solution will be decomposed by the soap solution in the pores of the brick or plaster and a sebate of iron or of copper be produced in the pores, the sebates being impervious to water.—*Carpentry and Building.*

CORRESPONDENCE.

MORTAR FOR TUCK POINTING.

EDITORS THE BRICKBUILDER:—

Dear Sirs:—Will you kindly inform me what kind of mortar is used for tuck pointing, *i. e.*, where mortar is put on outside of a brick building and a joint put on to make it appear like new work.

POINTER.

The composition of the mortar for tuck pointing depends upon what color is desired.

If a red joint is desired, the mortar should be composed of mineral red and very fine sand, thoroughly mixed, then worked with boiled linseed oil, and kneaded with the hands like putty. No water should be used. This composition will adhere very firmly, even to very smooth brick, and will wear for a number of years.

For a white joint, the best mortar is obtained by mixing lime putty and marble dust, with linseed oil mixed with the lime and water when the lime is slacked. Common lime putty and marble dust makes a very fair mortar, but the oil improves it. The oil must be worked in during the process of slacking and not afterwards.

For pointing stonework, where a ⅜ in. joint is generally used, and the joint raked out before pointing, Portland cement and fine sand, with a small portion of lime putty, is generally used for white mortar, while for a red joint mineral wool is substituted for the lime putty.

EDITORS.

EDITORS THE BRICKBUILDER:—

Dear Sirs:—I desire a white cement stucco for outside work: how can I best obtain it? By answering through the columns of your journal, you will greatly oblige.

ARCHITECT.

Cement stucco, properly speaking, is composed of cement and sand, and its color is determined by that of the cement. Portland cement, which is undoubtedly best for the purpose, gives a bluish-gray color. We believe that lime is sometimes added in small quantities, which tends to lighten it somewhat. We think it might be possible by using Utica (Ill.) cement and sand, clear, to obtain a stucco that will be a sort of light buff, but we do not think it possible to obtain a white cement stucco, except by painting with white lead and oil after the stucco is thoroughly dry. In some portions of the country plaster of Paris stucco has been extensively used of late, and also staff, although generally only in the way of a frieze or cast ornaments. These are generally nailed to the wall. Their natural color is a dull white, but they require painting to preserve them, so that the natural color is of no consequence. When painted, these materials stand fairly well, especially if not much exposed to the weather, but where an entire wall is to be covered with stucco, we would recommend plastering with Portland cement and sand, and then painting.

A very good description of exterior stucco, and also of the process employed in making the staff for the World's Fair buildings at Chicago, is given in Part I. of Kidder's "Building Construction and Superintendence."

Perhaps some of our readers can give us further information on the subject.

EDITORS.

EDITORS THE BRICKBUILDER:—

Gentlemen:—In your September number appears a reference to the failure of a brick pier which deserves a much more extended notice, and I think it would be worth while to collect more data so as to arrive at the facts of the case. Permit me to ask the following questions:—

It does not appear whether the pier in question was laid up in cement (if so, what kind, etc.) or lime mortar. If the work was done in freezing weather, how cold? Was mortar freshly made? Was sand heated? How long had the piers been built before they received their full load? How much of a bearing did the girders get on the walls? Had there been any motion on the floor, any dumping of material, or slipping or sliding? What kind of footings? Did they extend all round the pier or on one side only, as is usual with side walls in city lots? What kind of foundation was there?

It certainly does not appear that the brickwork should have crushed with a load which is hardly, if any, over that reckoned by many as a *safe* one; therefore if you have any more particulars at hand I think they would be appreciated by others as well as

SUBSCRIBER.

The pier in question was laid up in ordinary lime mortar, about the first of February; the bricks were not warmed and no especial care appears to have been taken with the work, but it was a fair average job of brickwork for the locality in which it was built, and which is there assumed to have a safe strength of about eight tons to the square foot. The temperature was above the freezing point when the bricks were laid, but dropped to about zero and possibly a few degrees below during the night.

The pier gave way about 5 P. M., of March 25, or about eight weeks after it was built. The day was stormy, and no work was being done; the day before the plasterers had completed browning the second story. The building was entirely empty, and there does not appear to have been any special cause for the accident at that time, except the wet plaster which had been applied the day before, and from the additional weight of which the pier probably commenced to fail.

The pier was built on top of a stone wall, 21 ins. thick, with footings extending on each side. Neither the bottom of the pier nor the stone wall showed any signs of moving or settlement, and, in fact, there can be little doubt but that the failure was caused by the buckling outwards of the pier, not by the pier crushing. The steel beams had a bearing on the wall of between 7 and 8 ins.

EDITORS.

STRENGTH OF A BRICK VAULT.

IN connection with the removal of the old Public Library building, Boston, to make way for building a new structure, it became necessary to tear out the vaulting which supported a portion of the sidewalk. There were four plain barrel vaults supported on walls at right angles to the line of the sidewalk, each vault covering about 10 sq. ft., with a rise of about 2½ ft., laid up in three rings loosely grouted over the haunches, a very ordinary form of construction, but one which was interesting by reason of its extreme cohesiveness. After the whole of the interior wall parallel to street line and three of the intermediate brick walls from which the arches sprung were entirely knocked away, the four vaults still remained in place, and were not materially weakened by a stone weighing over a ton being dropped on it repeatedly from a height of 20 ft. It was only after the crown of three of the arches was cut clear through that the work fell, and even then a considerable segment of one of the last arches remained in place, and it had to be torn down almost brick by brick. The material was ordinary good hard burned brick laid up in cement mortar. This work was laid in 1855.

Brick and Terra-Cotta Work in American and Foreign Cities, and Manufacturers' Department.

NEW YORK. — On election day a question of vital interest to New Yorkers was settled by vote of the people. By the adoption of the constitutional amendment, by which the individual debt of the counties now included in New York City is charged back upon the counties, the city's borrowing capacity is increased by thirty millions.

New York can now spend any part of sixty-five millions in completing the public library, improving the schools, insuring an ample water supply, and, most important of all, in building the sorely needed underground railway by which Harlem may be reached in fifteen minutes from the City Hall; and, as the corporation counsel's approval of the contract is assured, the Rapid Transit Commissioners will soon be able to invite bids for the construction of the tunnel. Of course, this will be an undertaking of great magnitude, as there is an underground city of which few people are aware, traversed and honeycombed by subways, sewers, and pipes of all kinds.

The delay in accomplishing this result has brought us into a period of reaction in the money markets, and it is, consequently, much more difficult to dispose of bonds than it would have been some months ago. This, however, is only a temporary difficulty. By the time the work is fairly under way, we may expect that a more plentiful supply of funds will be seeking investment, and New York's credit is so high that her bonds can always be sold on reasonably advantageous terms. Transit facilities are vitally needed, and the money put into the new road will yield splendid returns, not only directly but also indirectly, in stimulating the growth of the city and in increasing the taxable value of property in the sections opened up. No fogs will delay transit on the underground line, and such a blizzard as stopped the surface traffic last winter will not affect it. The people are eager for the new line, and work should be begun at the earliest practicable moment.

The work of demolishing the old reservoir at 42d Street to make way for the new public library has been going steadily forward; but, owing to the unusual strength and solidity of its construction, it has proved a much more difficult task than was anticipated, and is an object lesson to builders of the present day. It is always interesting to know how New York impresses foreigners, especially foreign architects. We quote from an interesting series of notes on New York, written for *The Builder*, by a London architect.

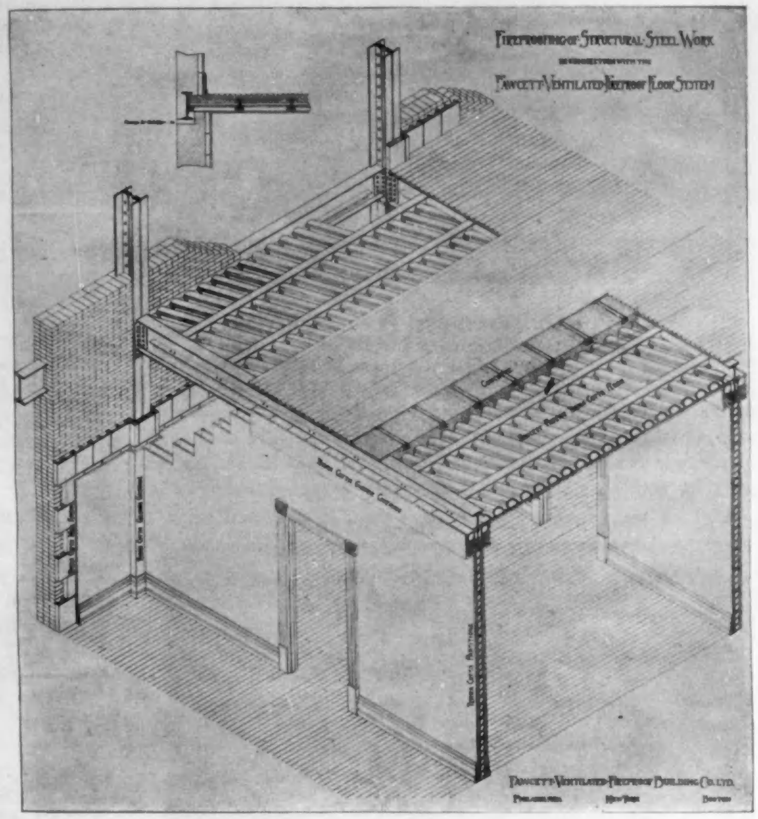
CAPITAL, ENTRANCE TO MEDICAL CHIRURGICAL HOSPITAL, PHILADELPHIA, PA.
Made by Conkling-Armstrong Terra-Cotta Company.
Herman Miller, Architect.

"There can be no doubt that it is beyond the Atlantic that we shall find the finest buildings of the future. Energy, wealth, and a desire to produce structures which shall be at once useful and beautiful, — all these things make towards the creation of finer architectural works than can be erected in an older country. Architectural individuality in New York is, moreover, given a very large field, a scope which is noticeable especially in regard to private houses. This freedom, though it necessarily from time to time must result in eccentricity, yet affords opportunity for much larger artistic effect than can be obtained in the more formal and systematic streets of English and Continental towns." Of our sky-scrapers he says: "The effect will presently be stupendous. There will be no other city like it in the world. It is all very well for passers-by to say buildings of such a size are monstrosities, but as utility is the first object of every building, it has to be admitted that the people of New York have by their system of building policy obtained not only space, but actually buildings comfortable and convenient up to the highest standard."

WESTMINSTER APARTMENTS, COPLEY SQUARE, BOSTON, MASS.
Front brick manufactured by the Eastern Hydraulic-Press Brick Company. Architectural terra-cotta made by Perth Amboy Terra-Cotta Company. Fire-proofed by the Fawcett Ventilated Fire-proof Construction Company.
Henry E. Cregier, Chicago, Architect.

Warren & Wetmore have planned a three-story brick, stone, and terra-cotta dwelling house, to be built at Tuxedo Park, New York, for Mr. Henry W. Munroe; cost, $150,000. C. P. H. Gilbert has prepared plans for a five-story brick dwelling, to be erected on 56th Street, for Mr. H. Seligman; cost, $80,000. Babb, Cook & Willard are planning a three-story brick and stone residence, to be erected on Fifth Avenue, between 90th and 91st Streets, for Mr. Andrew Carnegie; cost, $500,000.

Several architects have been invited to submit plans for the new Republican Club, which John Jacob Astor will erect on Fifth Avenue, near 55th Street.



THE FAWCETT VENTILATED FIRE-PROOFING SYSTEM, EMPLOYED IN THE WESTMINSTER APARTMENTS, BOSTON, MASS.

ST. LOUIS.— The recent competition held for the new buildings of the Washington University resulted in the selection of the designs submitted by Cope & Stewardson, of Philadelphia. Only six firms were invited, who were to receive compensation, although the board of directors signified their willingness to receive plans from any one wishing to submit them. The invited firms were Eames & Young and Shepley, Rutan & Coolidge, of this city; Cope & Stewardson, of Philadelphia; Carrere & Hastings, McKim, Meade & White, and Cass Gilbert, of New York. Messrs. Walter Cook, of New York, R. D. Andrews and Clipston Sturgis, of Boston, were called in to assist the board of directors, and their decision seems to give universal satisfaction.

The only buildings considered were the Brookings Building, the Bush Building, two Cupples Buildings, one for civil and the other for mechanical engineering, the Liggett Building or dormitory, and the Library or Ridgely Building. This is to form the nucleus of the institution on their new property lying adjacent to Forest Park on the west, and will cost something like $700,000. The other buildings will be built when the University has disposed of its down-town site.

FLAMBEAUX, RESIDENCE FOR W. W. ASTOR, ESQ., NEW YORK CITY.
Made by the Atlantic Terra-Cotta Company.
Clinton & Russell, Architects.

PITTSBURGH.— The extensive real-estate business of the past few months augurs well for increased building operations during the coming year; a large percentage of this has been in high-priced building lots in the best residence portions of the city, but there have been several sales in the business portion, the buyers intending to build soon.

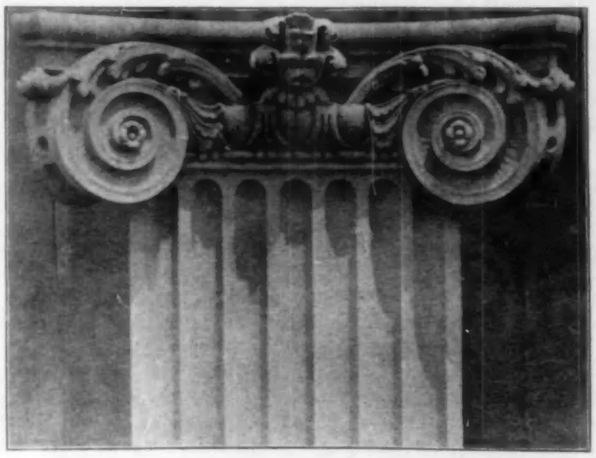
Most of the work which is now going ahead is for people who are building residences for themselves. There are, however, a large number of six and eight room houses and several apartment houses being planned and built at present, but the demand for such buildings is largely in excess of the supply. Materials are too scarce and prices too high to expect much speculative building, however, during the remainder of the year at least. There seems to be an idea in some quarters that prices will be lower by spring, but with coal, ore, and labor all advancing, this opinion does not seem to be well founded, at least so far as steel is concerned.

The scarcity of steel and iron is phenomenal. A Carnegie Company engineer stated a short time ago that he had a man at the Homestead Mills continually on the lookout for structural shapes, and then was not able to get them, and that for use on one of their own plants. Recently on a building in course of erection several extra I-beams were required, and after a thorough search of Jones & Laughlin's yards several 7 in. beams were found, but no 8, 9, 10 or 12 in. beams could be obtained. The annual exhibition at the art galleries

NORTHERN PACIFIC DEPOT, FARGO, NORTH DAKOTA.
Roofed with Lodowici Interlocking Spanish Tile.
Cass Gilbert, Architect.

WINDOW HEAD, APARTMENT, PHILADELPHIA, PA.
Made by Atlantic Terra-Cotta Company.
Yarnall & Gofarth, Architects.

of the Carnegie Institute, which was formally opened on November 2, is remarkably good this year. The first prize, a gold medal and $1,500, was awarded to Miss Cecilia Beaux, of Philadelphia, for her painting, entitled "Mother and Daughter"; the second prize, a



PILASTER AND CAP, TERMINAL HOTEL, BOSTON.
Made by the Atlantic Terra-Cotta Company.
A. H. Bowditch, Architect.

silver medal and $1,000, was awarded to F. W. Benson, of Salem, Mass.

Rutan & Russell are the architects of the P. & A. Telephone Company Building, cost $75,000, and they also have prepared plans for a residence in the East End, to cost $90,000. F. J. Osterling has the new Pathological Building for Mercy Hospital; Alden & Har-

ARCH PIECES, MAIN ENTRANCE, FEDERAL BUILDING, YOUNGSTOWN, OHIO.
Made by St. Louis Terra-Cotta Company.
D. H. Burnham & Co., Architects.

TERRA-COTTA CAPITAL.
Executed by the New Jersey Terra-Cotta Company.
Schneider & Herter, Architects.

low have prepared plans for an office building for the C., D. & P. Telegraph Company, to be built on the South Side, and also one for the same people, to be built in the Bellefield district.

MINNEAPOLIS.— Matters in the architectural line have been rather interesting, although large projects have been seriously delayed through lack of necessary structural iron and steel. The State University has several buildings under way, costing about $200,000, of which Mr. C. H. Aldrich is the architect. The Pillsbury-Washburn Company is erecting a new flouring mill, to cost $100,000. Frank B. Semple is erecting a $50,000 brick and stone residence from plans by Long & Son. The Realty Care and Improvement Company is a new organization made up of local and Eastern capitalists, for the improvement of desirable properties, and they have three or four buildings in hand at present, and promise to be a decided factor in the future of Minneapolis. One of the buildings they are ready to begin will cost $40,000. They have picked

CORBEL, ENTRANCE TO HAMILTON BUILDING, AKRON, OHIO.
Made by the Northwestern Terra-Cotta Company.
Mead & Garfield, Architects.

up several desirable corners and we may expect something substantial from them soon.

G. H. Christian is building a new brick flouring mill, to cost $100,000. Architect Fred Kees is planning an addition to Donaldson's Glass Block, to cost $60,000. The same architect is also planning a general store building for the Detroit Copper Mining Company, at Morenci, Arizona, to cost $40,000. The Methodists of the Northwest will erect a large hospital in this city next year at a cost of $150,000. It will be 297 by 100 ft., five stories, of brick and terra-cotta, fire-proof; E. P. Overmire, architect; capacity, about two hundred patients.

W. J. Keith is planning a business building for the old Westminster corner, at Nicollet and Seventh Streets, to be eight stories, fire-proof, pressed brick and terra-cotta fronts, to cost $175,000.

The deal for a new Chamber of Commerce having fallen through, they are now figuring on another, looking to enlargement of present building, at cost of about $125,000.

In St. Paul the most interesting event in architectural circles is the selection of Mr. Cass Gilbert as architect for the New York Custom House, to cost $3,000,000. The architects of the Northwest know Mr. Gilbert to be all right, morally and professionally, and regard him as the leading architect of the West and Northwest to-day, and one of the leaders of the profession in the United States. He has opened offices in New York City, where he planned a "sky-scraper" for Boston parties this year. He is planning the new $250,000 depot which the Northern Pacific Railway Company will erect at Seattle, Wash.

The Northwestern Grass Twine Company is erecting a factory building at their Como Avenue plant, to cost $60,000, from plans by F. P. Sheldon, of Providence, R. I.

MANUFACTURERS' CATALOGUES AND SAMPLES DESIRED.

THE following-named architects would be pleased to receive manufacturers' catalogues and samples: Francis J. MacDonnell, 906 Hennen Building, New Orleans, La.; Meyers & Fisher, Jamison Block, Williamsport, Pa.

CURRENT ITEMS OF INTEREST.

CHAMBERS BROTHERS COMPANY, of Philadelphia, are making an extension to their boiler house and erecting an additional boiler of 200-horse power. They are also equipping their iron, brass, and bronze foundry.

THE recently incorporated Burns-Russell Brick Company, of Maryland, will use the Chambers machinery, the whole outfit, including engine and boiler, being nearly erected and ready for use.

BALUSTRADE OVER ENTRANCE, HIGH SCHOOL, TROY, N. Y.
Work executed by the New York Architectural Terra-Cotta Company.
M. F. Cummings & Son, Architects.

THE POWHATAN CLAY MANUFACTURING COMPANY are delivering their "salt and pepper" bricks for the new station of the Southern Railway Company, at Richmond, Va.; also for a new three-story business block, and for seven new residences at Richmond.

THE EXCELSIOR TERRA-COTTA COMPANY, through their Boston agent, Charles Bacon, are supplying the terra-cotta for the following buildings: Pemberton Building, Pemberton Square, Boston, Fehmer & Page, architects; church at Leominster, Mass., Maginnis, Walsh & Sullivan, architects; church at Northampton, Mass., Maginnis, Walsh & Sullivan, architects.

TERRA-COTTA PANEL.
Executed by the American Terra-Cotta and Ceramic Company.

SAYRE & FISHER COMPANY, through their Boston agent, Charles Bacon, are serving their brick for the following building operations in Boston: Burrage House, Commonwealth Avenue, Chas. Brigham, architect; Bradley House, Commonwealth Avenue, Little & Brown, architects; eight houses for W. D. Vinal, Bay State Road; Massachusetts General Hospital (addition to), Wheelwright & Haven, architects; Albany Building, Peabody & Stearns, architects.

THE CELADON TERRA-COTTA COMPANY, LTD., through their Boston agent, Charles Bacon, are furnishing the roofing tile for the following buildings: House at Beaconsfield Terrace, for H. M. Whitney; gate lodge at Middlesex Fells, Shepley, Rutan & Coolidge, architects; Everett School, Cooper & Bailey, architects; church at Cohasset, Mass., donated by Col. Albert Pope, Frederick Pope, architect; Wayland Library, Wayland, Mass., Cabot, Everett & Mead, architects.

PORCH AND PORTE COCHERE CAPITALS, HOUSE AT NEW ROCHELLE, N. Y.
Made by White Brick and Terra-Cotta Company.
Clinton & Russell, Architects.

THE WHITE BRICK AND TERRA-COTTA COMPANY has lately secured the contracts to furnish the architectural terra-cotta for the following buildings: Store and lofts, West Broadway and Spring Street, New York City, Small & Schuman, architects; residence, East 80th Street, New York City, Wallace & Gage, architects; apartments, 109th Street and Broadway, New York City, Henry Anderson, architect; store building, Berkeley, Va., J. E. R. Carpenter, architect.

THE complete destruction by recent fire of the plant of the Boston Fire Brick Works, Fiske & Co., managers, has resulted in a very large increase of their orders to the various brick concerns

OHIO PYTHIAN ORPHANS' HOME, SPRINGFIELD, OHIO.
Ironclay mottled brick, the Columbus Face Brick Company, Columbus, Ohio.
Yost & Packard Architects, Columbus, Ohio.

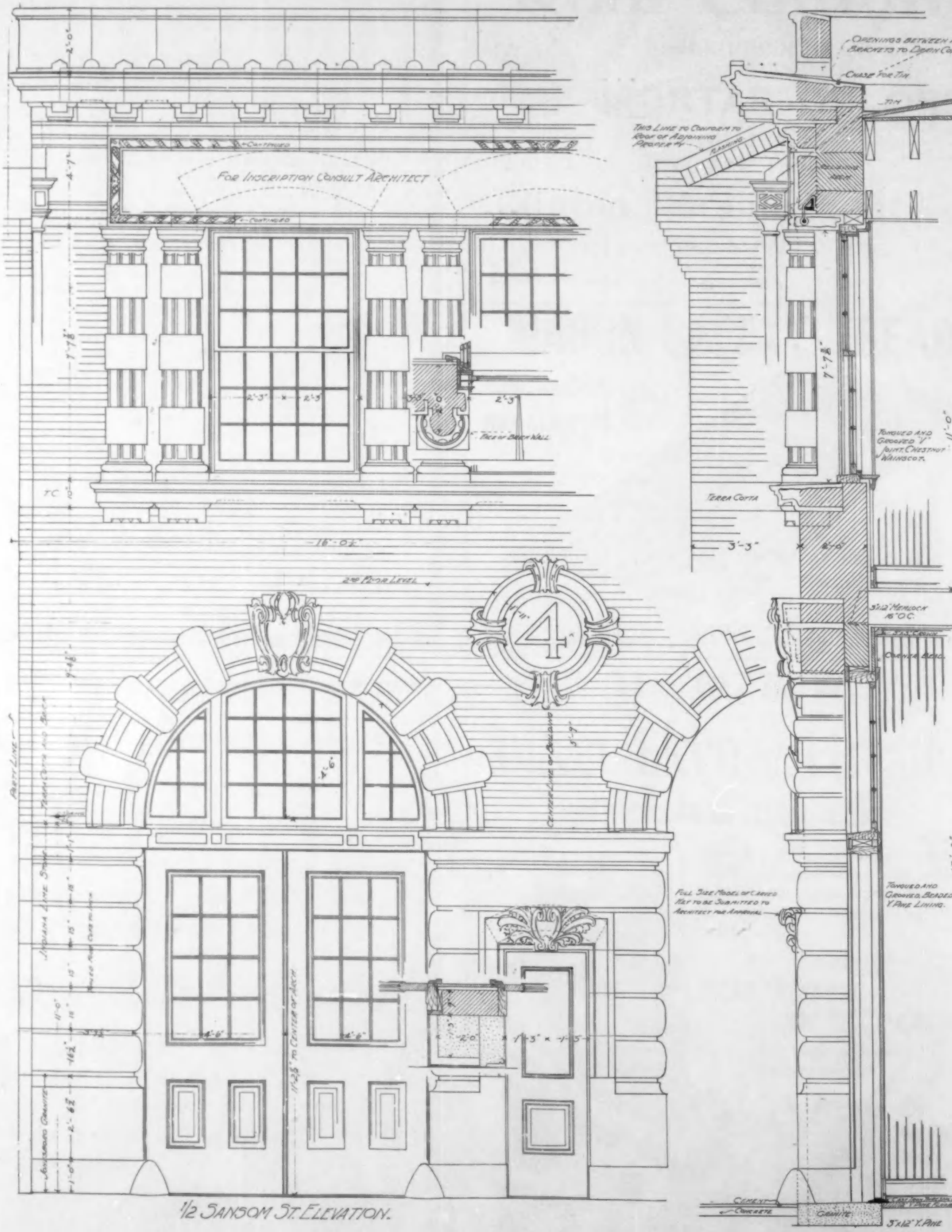
for whom they are the New England agents. They are now sending to architects throughout New England a line of very fine samples of bricks manufactured by their various plants, and are receiving substantial returns.

"Colonial buff," a new shade of delicate lemon yellow, has been received with special favor, as it produces a pleasing effect when used with white trimmings. Though of but recent introduction to the market, it has already been booked for several large buildings, including the Bigelow Grammar School, Newton, Mass., Bigelow Grammar School, East Boston, Mass., Converse Building, Malden, Mass., and a number of apartment houses at Boston and vicinity.

"Pearl white," of a very light blue-gray tinge, is a specially fine brick. Manufacturers have found it comparatively easy to produce a brick white in color as it comes from the kiln; but when exposed to the weather in the building, many of these bricks, after a few months' wear, become so soiled, stained, and discolored as to be offensive to the eye and a detriment to the buildings where they are used. The "pearl white" is claimed to be absolutely impervious to water, stain, and other discoloration and to permanently retain its original brightness and beauty.

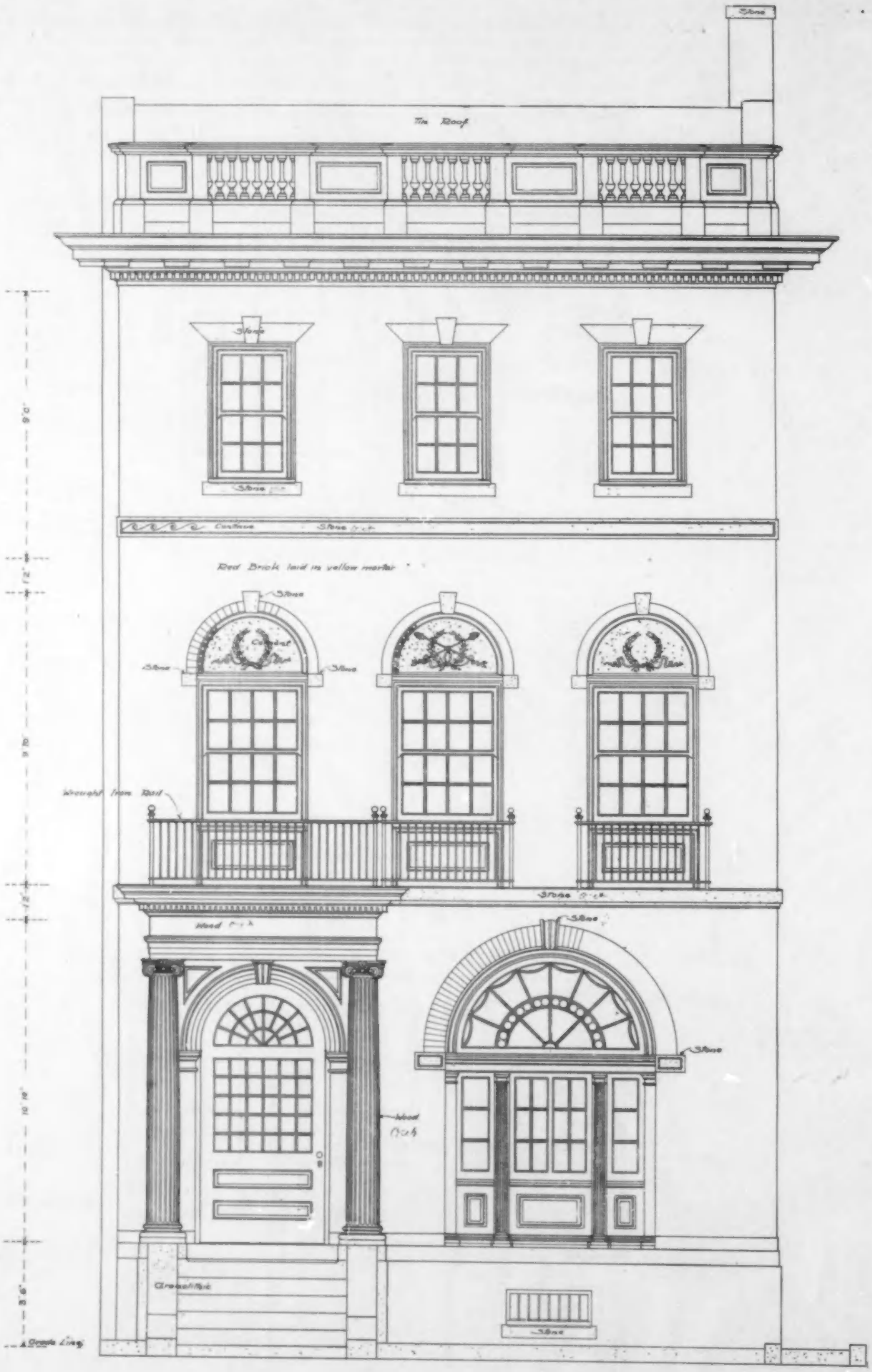
The firm has booked many other orders throughout New England for their gray, red, buff, and mottled shades, among the principal of which are the following: Chapman School, East Boston, Mass.; Worcester Court House, Worcester, Mass.; State Asylum, Foxboro, Mass.; theater, Amesbury, Mass.; college building, Hartford, Conn.; mercantile building, Boston Wharf Company, Boston, Mass.; mercantile buildings at Leominster, Hartford, Worcester, Holyoke, and Braintree; apartment houses at Worcester, Dorchester, Brookline, Cambridge, Somerville, Holyoke, and Boston; chapel at Mount Hope Cemetery, Boston, and numerous small apartment houses, private dwellings, etc., throughout New England.

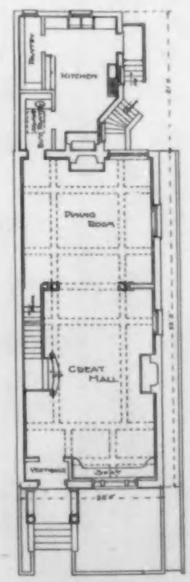
The Celadon Terra-Cotta Company, Ltd., are supplying the roofing tile for the following building operations: First Methodist Episcopal Church, Upper Sandusky, Ohio, Frank L. Packard, architect; Memorial Chapel, Rose Hill, Chicago, J. L. Silsbee, architect; Medical Institute, Battle Creek, Michigan, Robert B. Newberry, architect; library at Torrington, Conn.; residence at Blue Island, Chicago, Ill., M. E. Siefert, architect; residence at Danville, Ill., E. W. Lewis, architect; residence at Oak Park, Ill., Charles Thisslew, architect; residence for Mr. Fisher, St. Louis, Mo.; Tower tile for Valley Forge, Ga., water works; sanatorium at Sycamore, Ill., W. B. Fall, architect; apartment house, Des Moines, Iowa, Dewey & Co., architects; residence at Chicago, Ill., Joseph D. Atchison, architect; two schoolhouses, St. Louis, Mo.; station for the C. R. I. & P. Railway, Peoria, Ill., Frost & Granger, architects; United States Mint Building, Denver, Col., James Knox Taylor, architect; residence for B. M. Kuhn, Bloomington, Ill.; residence for M. Jones, St. Louis, Mo., Augst. Beineke, architect; residence at Chicago, Ill., Bishop & Co., architects; residence and stables at Chicago, Ill., A. Werner, architect; residence and stable at Chicago, Ill., Wilson & Marshall, architects; residence at Plainfield, N. J., Charles H. Smith, architect; residence, Summit, N. J., Brite & Bacon, architects; residence at St. Louis, Mo., J. Conradi, architect; Tower tile, Heirz Building, Pittsburgh, Pa.



FIRE HOUSE No. 4, PHILADELPHIA, PA.

E. V. SEELER, ARCHITECT.

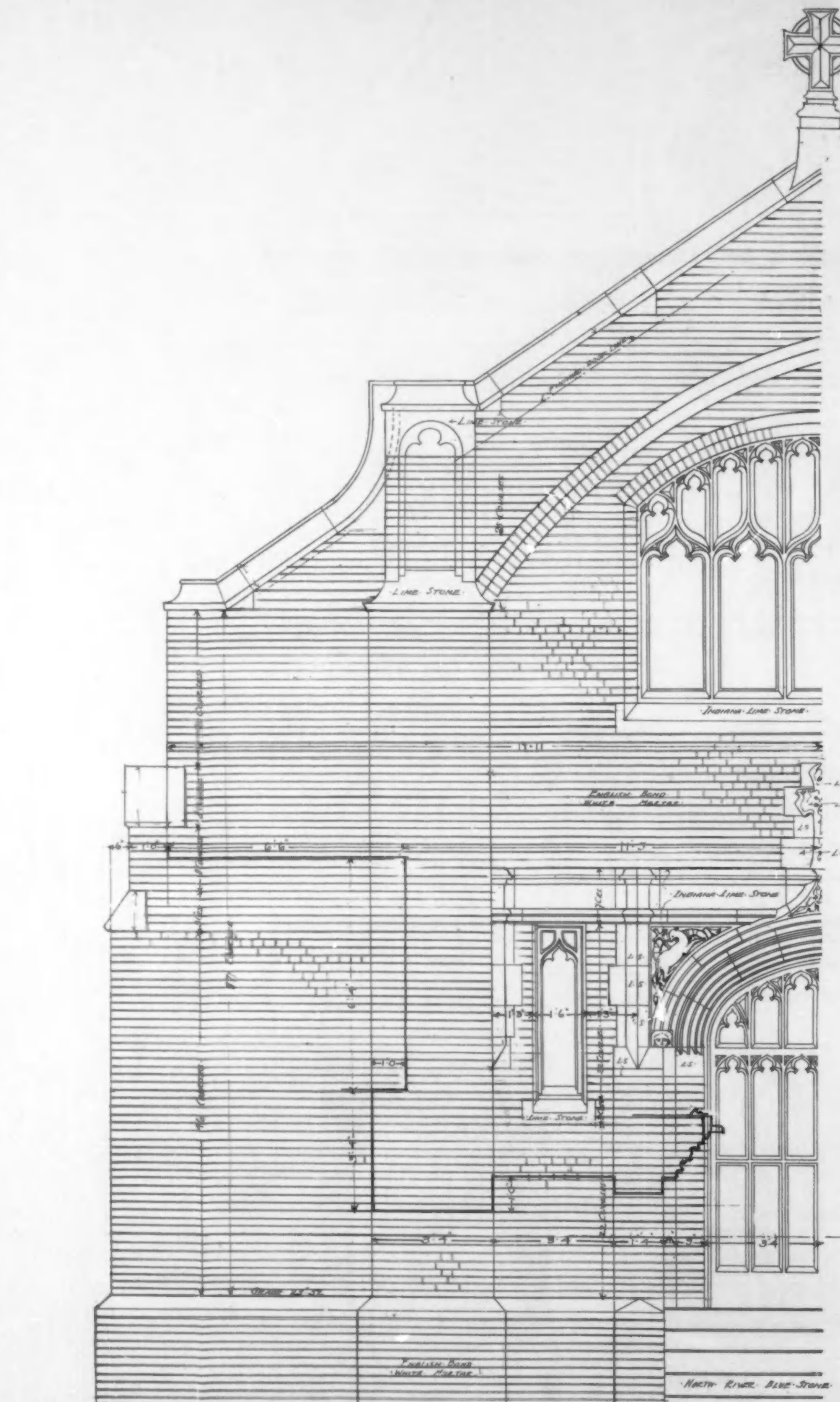




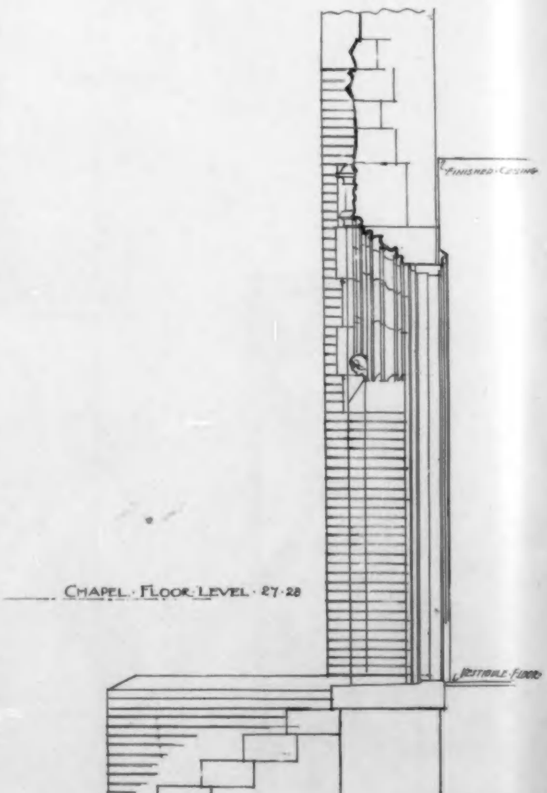
PLAN.

RESIDENCE AT WASHINGTON, D. C.

TOTTEN & ROGERS, ARCHITECTS.



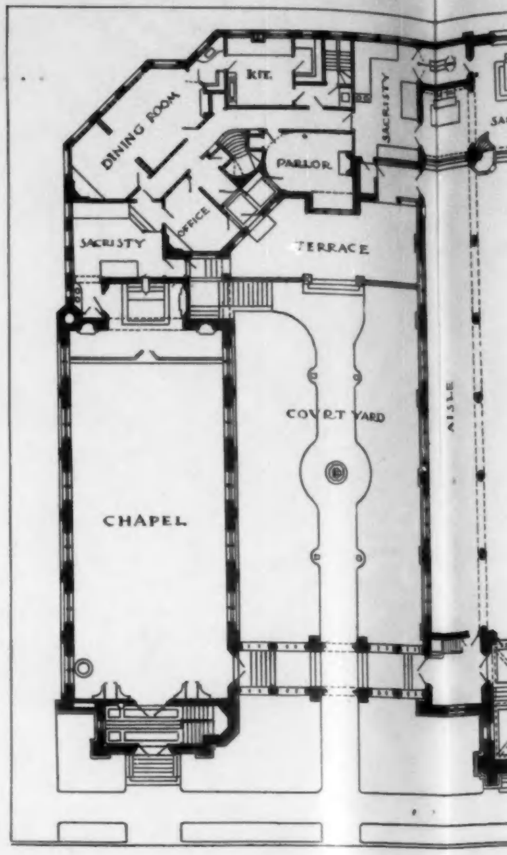
HALF ELEVATION · OF · CHAPEL FRONT

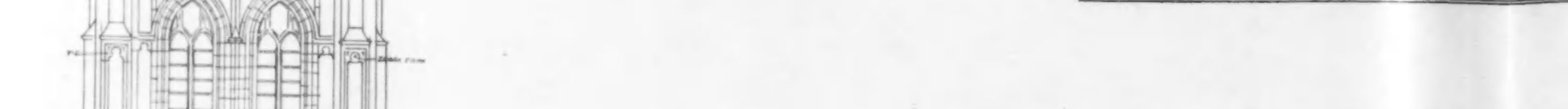


·SECTION · THRO · CHAPEL ·ENTRANCE

ST. LEO'S CHURCH, LEOMINSTER, MASS.

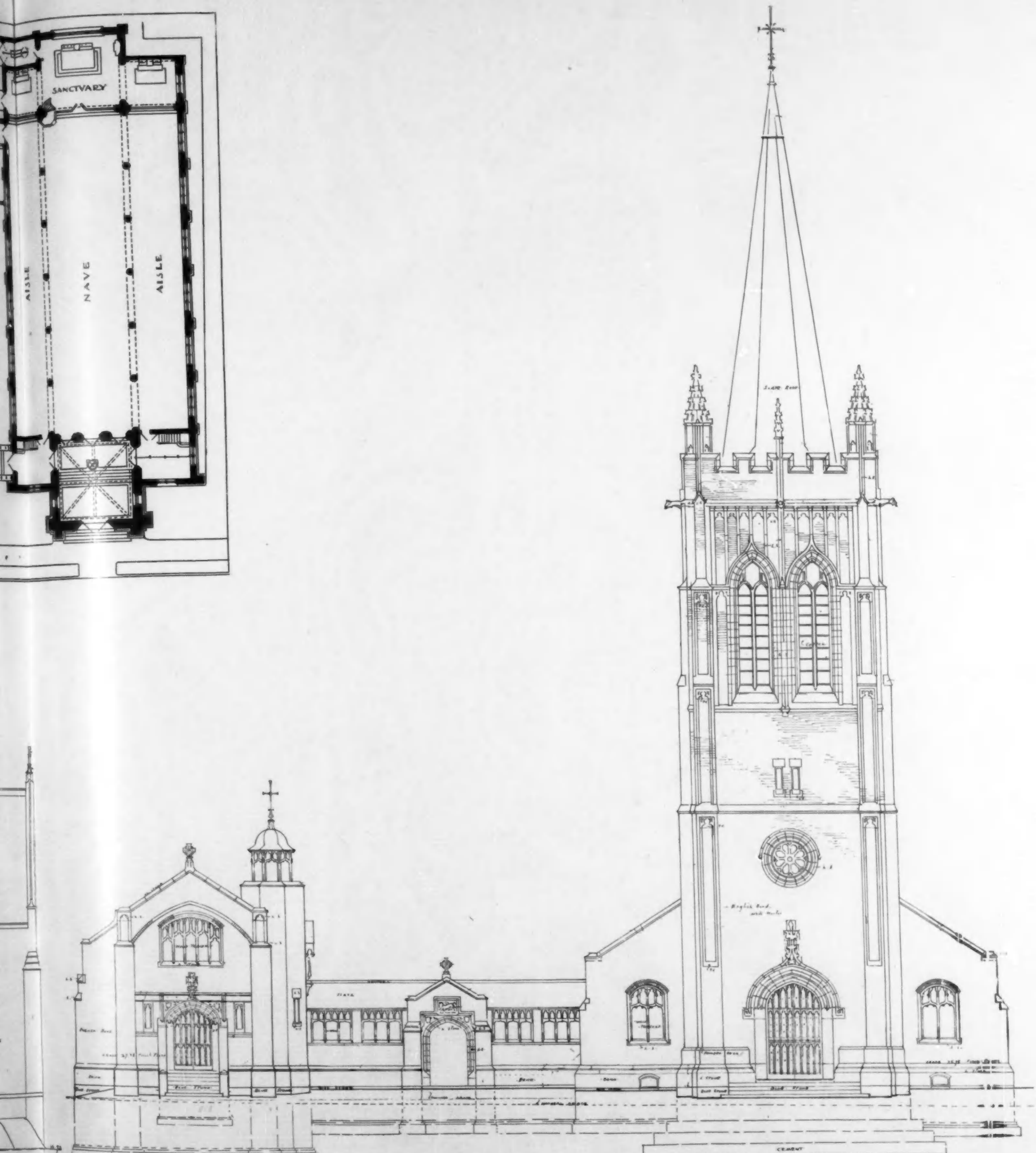
MAGINNIS, WALSH & SULLIVAN, Architects.





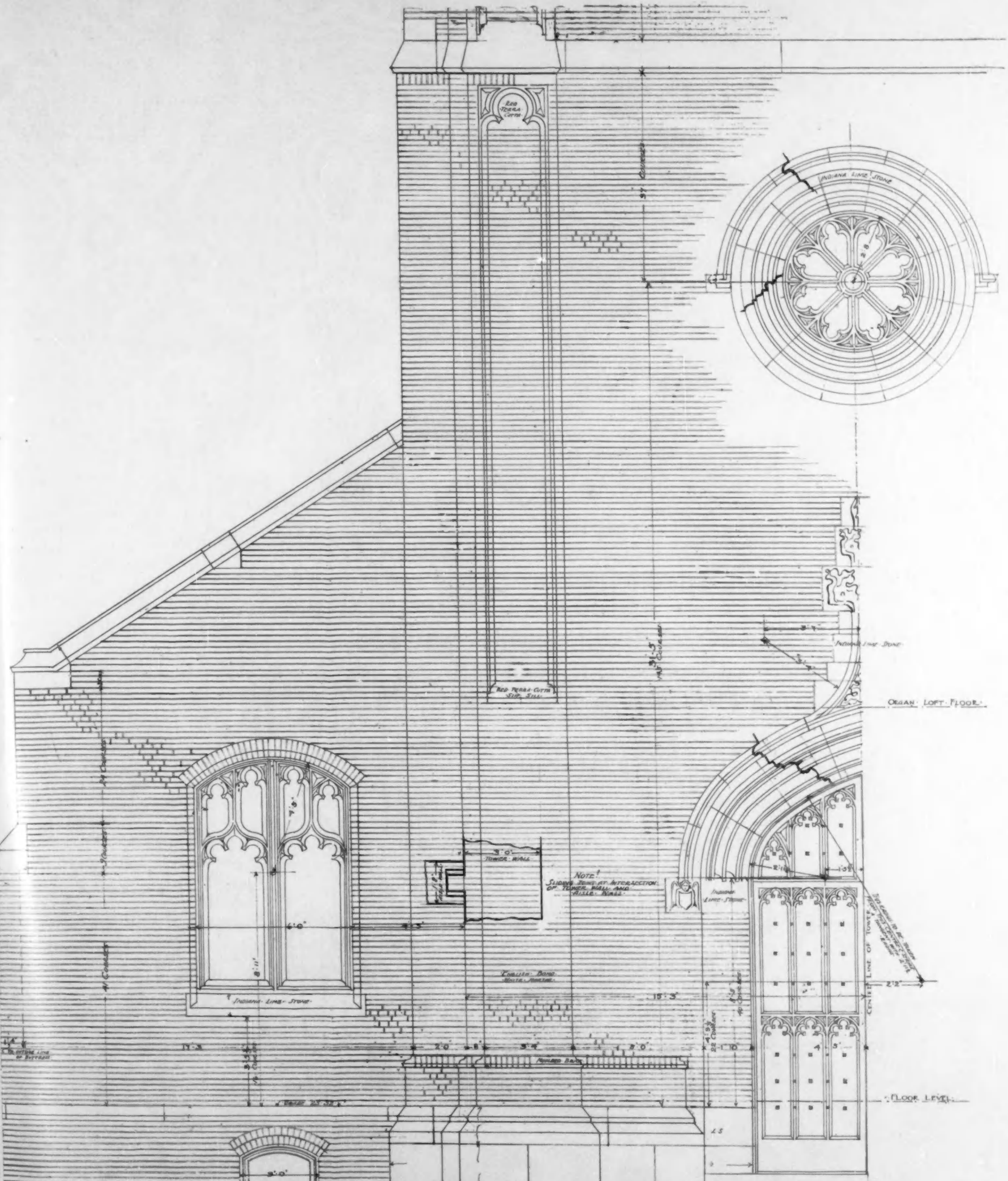
ST. LEO'S CHURCH, LEOMINS
MAGINNIS, WALSH & SULLIVAN

PLATES 84 and 85.



CH, LEOMINSTER, MASS.

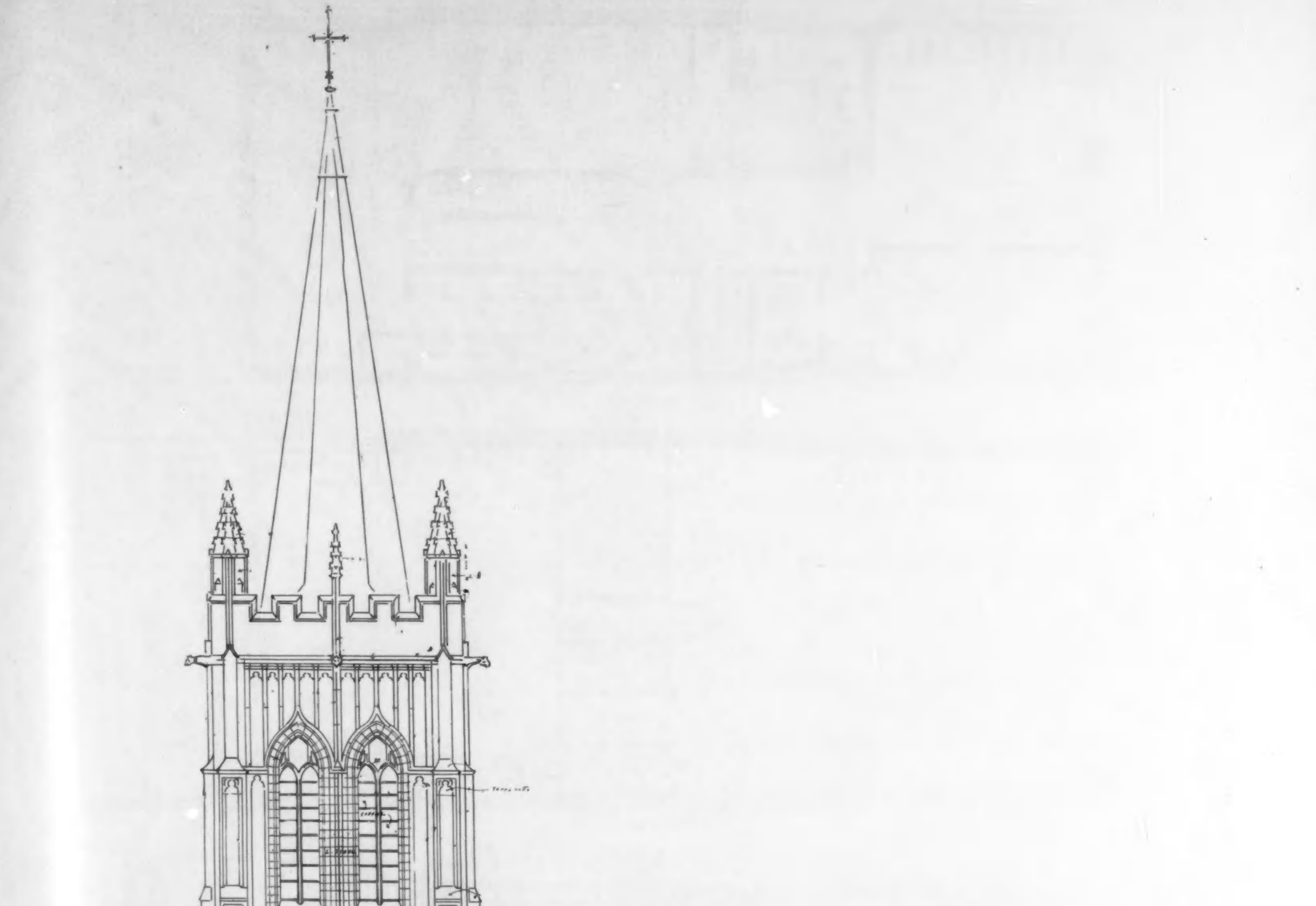
SH & SULLIVAN, Architects.



ELEVATION OF LOWER PART OF TOWER.

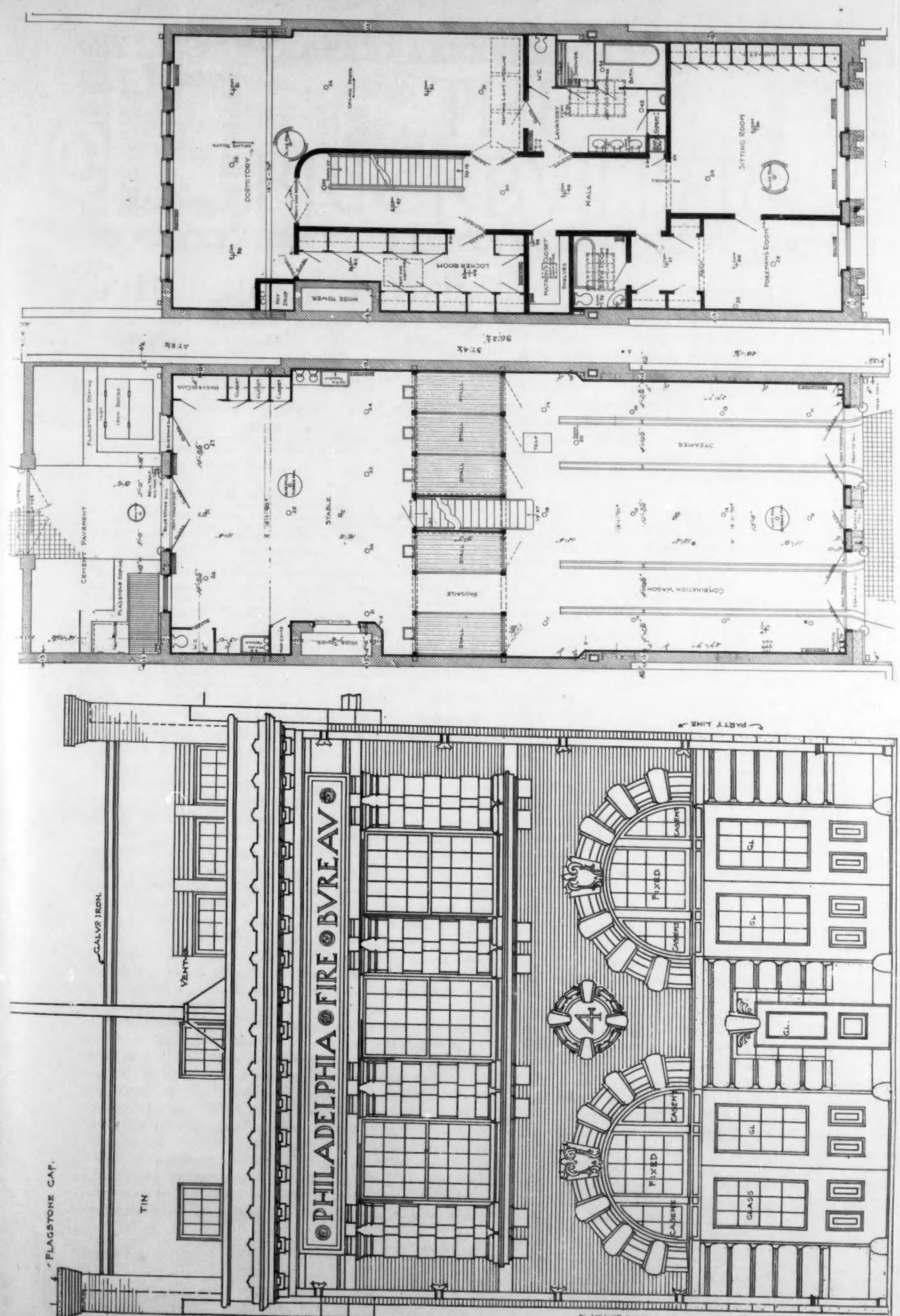
ST. LEO'S CHURCH, LEOMINSTER, MASS.

MAGINNIS, WALSH & SULLIVAN, ARCHITECTS.



ST. LEO'S CHURCH, LEOMINSTER, MASS.

MAGINNIS, WALSH & SULLIVAN, Architects.



SECOND FLOOR.

FIRST FLOOR.

FRONT ELEVATION.

FIRE HOUSE No. 4, PHILADELPHIA, PA. E. V. SEELER, ARCHITECT.